ATLANTIC TESTING LABORATORIES, LIMITED

atl

Box 29
Canton, N.Y. 13617
(315) 386-4578

Box 356
Cicero, N.Y. 13039
(315) 699-5281

March 16, 1989

U.S. Army Engineering Division, New England
424 Trapelo Road
Waltham, MA 02254-9149

Attn: Chief, Engineering Division, NEDED

Re: Delivery Order No. 0008
Birch Hill Dam, South Royalston, MA
ATL Project No. CD033-88

Gentlemen:

Enclosed are one original and two copies of the referenced report for your review.

Sincerely,

Spencer F. Thew, P.E./L.S.

SFT/smf

Encs.

SECTION I
Birch Hill Dam Piezometer Installation
South Royalston, Massachusetts

Contract No. DACW33-87-D-0007
Delivery order No. 0008

Contracting Officer:

Stanley J. Murphy, Lt. Colonel, CE
Deputy Division Engineer

PREPARED FOR: U. S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, MA 02254-9149

PREPARED BY: Atlantic Testing Laboratories, Limited
P.O. Box 29
Canton, New York 13617

ATL Report No. CD033-1-12-88

December 1988

SECTION 2

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- Cross Sections (3)
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SECTION 3

SCOPE OF INVESTIGATION

a. Delivery Order No. 0008

CD033

CHECKED BOX APPLIES			PAGE 1 OF
	[X] ORDER FOR SUPPLIES OR SERVICES	[ ] REQUEST FOR QUOTATIONS NO. RETURN COPY(IES) OF THIS QUOTE BY *(THIS IS NOT AN ORDER. See DD Form 1155r)*	3

1. CONTRACT/PURCH ORDER NO.	2. DELIVERY ORDER NO.	3. DATE OF ORDER	4. REQUISITION/PURCH REQUEST NO.	5. CERTIFIED FOR NATIONAL DEFENSE UNDER DMS REG 1 DO
DW33-87-D-0007	0008	88 SEP 23	GEB 88-29	

6. ISSUED BY: Dept. of the Army CODE
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, MA 02254-9149
Buyer/Symbol: Kewer/CENED-CT-C Phone: AC 617-647-8414

7. ADMINISTERED BY *(other than 6)* CODE

8. DELIVERY FOB
[X] DEST
[ ] OTHER
(See Schedule if other)

9. CONTRACTOR/QUOTER CODE FACILITY CODE

NAME AND ADDRESS
Atlantic Testing Laboratories,
Limited
P.O. Box 29
Canton, New York 13617

10. DELIVER TO FOB POINT BY:
In accordance with Paragraph 6 of the Scope of Work

11. CHECK IF BUSINESS IS
[X] SMALL
[ ] SMALL DISADVANTAGED
[ ] WOMEN-OWNED

12. DISCOUNT TERMS
NET

13. MAIL INVOICES TO: Finance & Accounting Officer at issuing office

14. ~~SHIP TO~~ Services for: CODE
U.S. Army Engineer Division, New England
ATTN: Geotechnical Engineering Branch
424 Trapelo Road
Waltham, MA 02254-9149

15. PAYMENT WILL BE MADE BY: CODE
Finance & Accounting Officer
U.S. Army Engineer Division, N.E.
424 Trapelo Road
Waltham, MA 02254-9149

MARK ALL PACKAGES AND PAPERS WITH CONTRACT OR ORDER NUMBER

16. ~~DELIVERY~~ ORDER

DELIVERY	X	This delivery order is subject to instructions contained on this side of form only and is issued ~~subject to the terms and conditions~~ in accordance with and subject to terms and conditions of above numbered contract.
PURCHASE		Reference your furnish the following on terms specified herein, including, for U.S. purchases.

General Provisions of Purchase Order on DD Form 1155r *(EXCEPT CLAUSE NO. 12 APPLIES ONLY IF THIS BOX [ ] IS CHECKED, AND NO. 14 IF THIS BOX [ ]*
IS CHECKED); special provisions ; and delivery as indicated. This purchase is negotiated under authority of
10 USC 2304(a)(3) or as specified in the schedule if within U.S., its possessions or Puerto Rico; if otherwise under 2304(a)(6).
[ ] *If checked, Additional General Provisions apply; Supplier shall sign "Acceptance" on DD Form 1155r and return* copies.

17. ACCOUNTING AND APPROPRIATION DATA/LOCAL USE
3123 O&M CE Civil
J102074OOK0000(MD)

SBSA
GEB
STATUS
MAK/ckh

18. ~~ORDER~~ CONTRACT	19. SCHEDULE OF SUPPLIES/SERVICES	20. QUANTITY ORDERED/ ACCEPTED *	21. UNIT	22. UNIT PRICE	23. AMOUNT
LINE ITEM NO.	Furnish the necessary personnel and equipment for installation of piezometers at Birch Hill Dam, South Royalston, MA, in accordance with Attachment No. 1.	APPROX.			ESTIMATED
1.0	GEOTECHNICAL FIELD INSPECTOR SERVICES				
1.2	Geotechnical Inspector	240	HR	$ 42.00	$10,080.00
1.3	Per Diem - Overnight Stay	32	DAY	50.00	1,600.00
1.4	Mileage from Waltham, MA & Return	240	MI	.35	84.00

* *If quantity accepted by the Government is same as quantity ordered, indicate by ✓ mark. If different, enter actual quantity accepted below quantity ordered and encircle.*

24. UNITED STATES OF AMERICA
BY: STANLEY J. MURPHY, Lt. Col., CE
Deputy Division Engineer
CONTRACTING/ORDERING OFFICER

25. TOTAL $65,460.00
29. DIFFERENCES

26. QUANTITY IN COLUMN 20 HAS BEEN:
[ ] INSPECTED [ ] RECEIVED [ ] ACCEPTED, AND CONFORMS TO THE CONTRACT EXCEPT AS NOTED

27. SHIP NO.
[ ] PARTIAL [ ] FINAL

28. D.O. ~~VOUCHER~~ NO.

30. INITIALS

32. PAID BY

33. AMOUNT VERIFIED CORRECT FOR

DATE SIGNATURE OF AUTHORIZED GOVERNMENT REPRESENTATIVE

31. PAYMENT
[ ] COMPLETE [ ] PARTIAL [ ] FINAL

34. CHECK NUMBER

I certify this account is correct and proper for payment.

DATE SIGNATURE AND TITLE OF CERTIFYING OFFICER

35. BILL OF LADING NO.

37. RECEIVED AT	38. RECEIVED BY	39. DATE RECEIVED	40. TOTAL CONTAINERS	41. S/R ACCOUNT NUMBER	42. S/R VOUCHER NO.

ITEM NO / CONTRACT LINE	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
2.0	GEOTECHNICAL SERVICES AND REPORT	APPROX.			ESTIMATED
2.1	Geotechnical Report	1	JOB	55% of Line Item 1.2	5,544.00
3.0	SURVEYING				
3.1	Mobilization and Demobilization	1	JOB	350.00	350.00
3.2	Mileage to and from Waltham, MA	120	MI	.35	42.00
3.4	Survey Crew and Equipment	1	DAY	560.00	560.00
3.5	Overnight Per Diem for Survey Crew	1	DAY	100.00	100.00
3.6	Data Reduction and Plotting	1	JOB	80% of Line Item 3.4	448.00
6.0	MOBILIZATION AND DEMOBILIZATION ONE DRILL RIG, CREW AND AUXILIARY EQUIPMENT				
6.1	Mobilization and Demobilization	2	JOB	1,100.00	2,200.00
3	Mileage from/to Manchester, New Hampshire	240	MI	1.15	276.00
6.5	Standby time/on site moves	90	HR	80.00	7,200.00
4.0	DRIVE SAMPLE BORING, UNCASED HOLE				
4.1	0-50 ft. depth	142	LF	25.00	3,550.00
4.2	51-150 ft. depth	42	LF	40.00	1,680.00
8.0	DRIVING AND PULLING CASING				
8.2	HX and 6-inch size	406	LF	30.00	12,180.00
9.0	DRIVE CASING AND/OR PIPE AND LEAVING IN PLACE				
9.6	Pipe (4" I.D., 1/4" Wall)	80	LF	25.00	2,000.00
.0	CASING AND PIPE				
0.4	Pipe (4" I.D., 1/4" Wall)	80	LF	9.00	720.00
2.0	DIAMOND CORE DRILLING VERTICAL				
2.4	4 X 5-1/2 size, Double Tube Barrel	32	LF	75.00	2,400.00

NAME OF OFFEROR OR CONTRACTOR

ATLANTIC TESTING LABORATORIES, LIMITED

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		APPROX.			ESTIMATED
24.0	PIEZOMETER				
24.1	Casagrande type/or equal, 0-50 ft. depth	639	LF	16.00	10,224.00
24.2	Casagrande type/or equal, over 50 ft. depth	39	LF	18.00	702.00
31.0	LIGHT LUMBER FOR SHORING EXCAVATION				
31.1	Light Lumber for Shoring Excavation	2	MBF	800.00	1,600.00
34.0	TRUCK WITH TOWING WINCH				
34.1	Truck with Tow Winch	24	HR	80.00	1,920.00

ATTACHMENT NO. 1

GEB REQUISITION 88-29- DACW 33-87-D-0007

DELIVERY ORDER NO. 0008

INSPECTION AND EXPLORATION INSTRUCTIONS

PROJECT: Birch Hill Dam Piezometer Installation

SITE: Birch Hill Dam, South Royalston, MA

PURPOSE: To determine internal phreatic surface

1. SCOPE OF INVESTIGATIONS

a. Eight borings shall be completed, four at Sta 7+00 and four at Sta 10+50. Offsets are shown on Attachments 2, 3, and 4. Field locations will be staked by New England Division personnel prior to start of work. Plan and section of the areas to be drilled are shown on Attachments 2, 3, and 4.

b. Borings will be advanced using six inch or four inch casing to the elevations indicated on the piezometer installation details. Soil sampling shall be continuous and shall be performed using SPT procedures in sands, and a 2-1\2 inch I.D. sample spoon in gravels. Sampling instructions particular to each boring are shown on the piezometer installation details.

c. All elevations and installation details are subject to change as the work progresses. Close coordination with GEB personnel is required during drilling operations to determine final piezometer elevations and installation details. The objective is to locate the upper piezometer tips in the pervious sand and gravel layer located at the interface of the embankment and foundation. The lower piezometer tips will be located in the less pervious m-f sands and fine sandy silts.

d. Only Revert drilling fluid (or other biodegradable drilling fluid) shall be permitted to keep the hole open.

e. Atlantic Testing shall supply all sample jars. The entire sample shall be saved and labeled.

f. Piezometers shall be installed as shown on the attached pages (Attachments 5 through 12). The top riser pipes of double piezometers shall be of different colors to distinguish upper and lower tip settings. The color of each piezometer number shall be noted on the boring logs. Final locations of piezometer tips shall be approved by New England Division personnel.

g. All piezometers shall be capped with one solid 10 foot piece of 4 inch pipe grouted in the hole and backfilled with sand only. A vented screw cap shall be provided for each of the six slope holes and a flush fitting water gate box or equivalent shall be provided for the two crest holes. Six inch casing shall not be used to cap the piezometers because the dam tenders are not supplied with 36" pipe wrenches. Six inch casing can only be used if the top is modified down to a four inch cap.

h. A sand filter shall be placed around each piezometer to the depth and elevation shown on the piezometer detail. Filter sand below the piezometer shall be tamped.

i. Falling-head permeability tests shall be performed on each piezometer after installation and the results recorded.

j. A geotechnical inspector shall act as field inspector while performing the borings. The inspector shall provide telephone reports to Mr. Anthony Firicano, Corps of Engineers, at telephone 617-647-8396 at least once every working day and upon completion of each boring. The alternate point of contact is Mr. John Hart at telephone 617-647-8389.

k. All samples shall be delivered to the Corps of Engineers Headquarters in Waltham, Massachusetts. Sample delivery shall be coordinated with the Director, NED Materials and Water Quality Laboratory at telephone 617-647-8367/8392.

2. SITE CONDITIONS

All borings are located on an earth and rockfill dam which is owned and operated by the Corps of Engineers. Six borings are located on the rockfill slopes of this dam. Means of locating and securing the drill rig to these slopes must be provided.

3. COORDINATION

The field inspector shall coordinate all work with the following NED personnel: Mr. Anthony Firicano 617-647-8396, Geotechnical Engineering Br., Waltham and Mr. James H. Bacon at 508-249-4467, Project Manager, Birch Hill Dam. Mr. Anthony Firicano shall be notified one week prior to the start of work.

4. EXPLORATION DESIGNATION

Borings shall be numbered FD-88-1 to FD-88-8 in the order of their completion.

5. GOVERNMENT REVIEW

The Government will review the draft submittal as well as the completed work. Subsequent to such review, the Contractor shall accomplish any corrections which may be directed as the result of the Government review.

6. COMPLETION SCHEDULE

Services under this delivery order shall start within 7 calendar days after receipt of the delivery order. Duration of field work is estimated to be twenty work days. The geotechnical report shall be submitted in draft format for review by the Government no later than seven calendar days after completion of the field work. Government review will take approximately ten calendar days from receipt of draft report. The final geotechnical report shall be submitted no later than seven calendar days after receipt of the corrected draft report including the action taken on possible comments.

7. QUALITY CONTROL

You will be held responsible for the quality of the submittals and for all damages caused the Government as a result of your negligence in the performance of any services furnished under the contract.

Although submissions required by your contract are technically reviewed by the government, it is emphasized that your work must be prosecuted using proper internal controls and review procedures. The letter of transmittal for each submission which you make shall include a certification that the submission has been subjected to your own review and coordination procedures to insure (a) completeness for each discipline commensurate with the level of effort required for that submission, (b) elimination of conflicts, errors and omissions and (c) the overall professional and technical accuracy of the submission. Documents which are significantly deficient in any of these areas will be returned to you for correction and/or upgrading prior to completing our review. Contract submission dates will no be extended if a resubmission of draft material is required for this reason.

BIRCH HILL DAM

PIEZOMETER DEPTHS AND ELEVATIONS

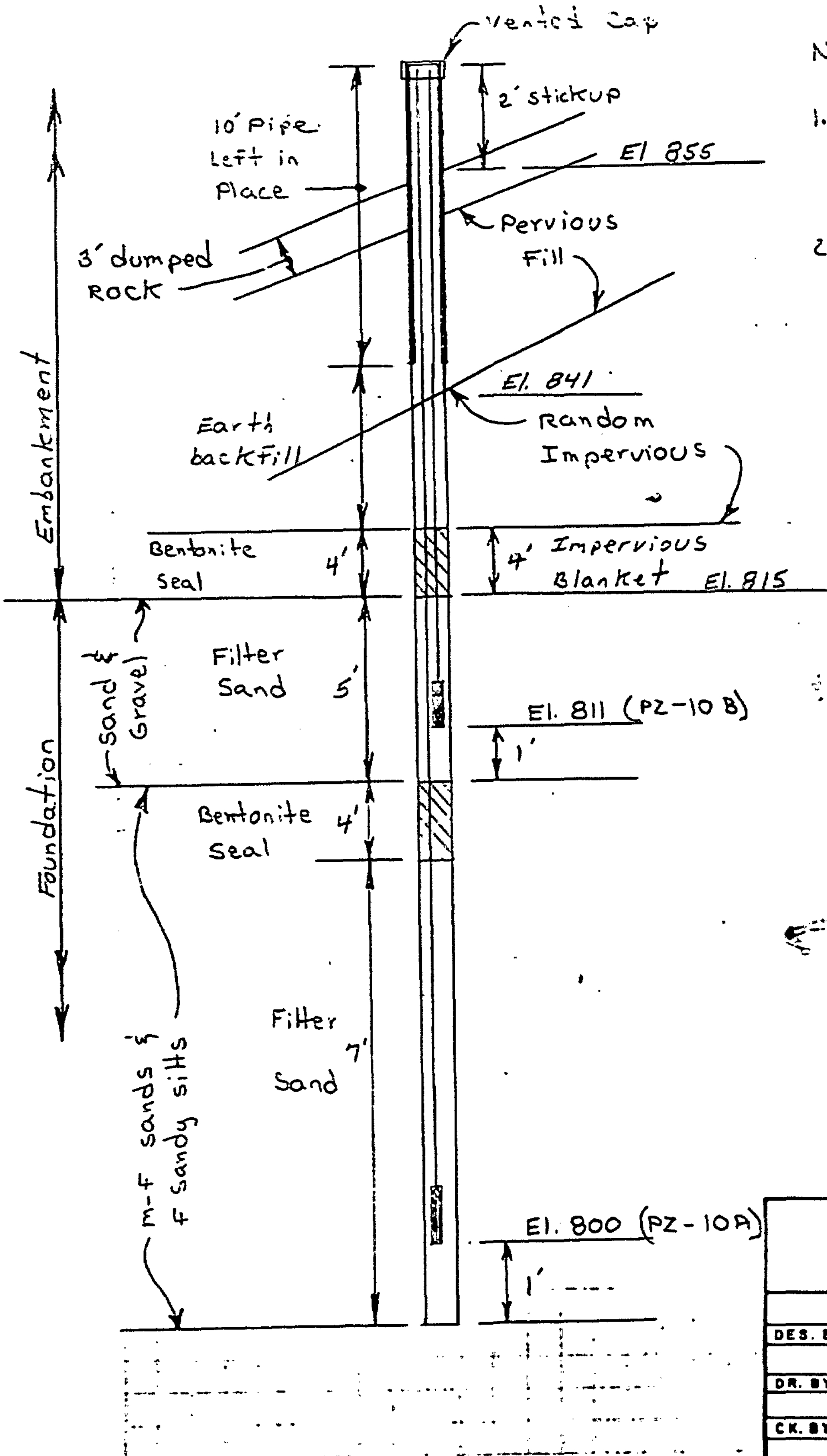
PIEZOMETER	TOP OF BORING ELEVATION	APPROXIMATE DEPTH OF BORING	BOTTOM OF BORING ELEVATION	PIEZ. TIP (S) ELEVATION	DEPTH 6 IN CASING
PZ-10 A&B	855	56	799	800 811	45
PZ-11 A&B	864	65	799	800 813	52
PZ-12 A&B	848	49	799	800 813	36
PZ-13 A&B	832	33	799	800 815	18
PZ-14 A&B	855	56	799	800 819	37
PZ-15 A&B	864	65	799	800 817	48
PZ-16 A&B	848	49	799	800 815	34
PZ-17 A&B	832	33	799	800 815	18

NED FORM 223
27 Sept 49

NEW ENGLAND DIVISION
CORPS OF ENGINEERS, U. S. ARMY

PAGE ______

SUBJECT Birch Hill Dam NH
COMPUTATION Piezometer Installation, PZ-10 A & B, Sta [illegible]
COMPUTED BY [illegible] CHECKED BY ______ DATE [illegible]



NOTES:

1. 6 in. ID hole to El. 810, 4 in. ID hole below El. 810.
2. Sampling:
   a. El. 855 to 820 - No sample
   b. El. 820 to Bottom of hole continuous samples.

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	BIRCH HILL DAM
DR. BY	PIEZOMETER INSTALLATI
CK. BY	

GEOTECH. ENG. BR. SCALE:
SK. NO. ATTACH 5 DATE:

NED FORM 223
27 Sept 49

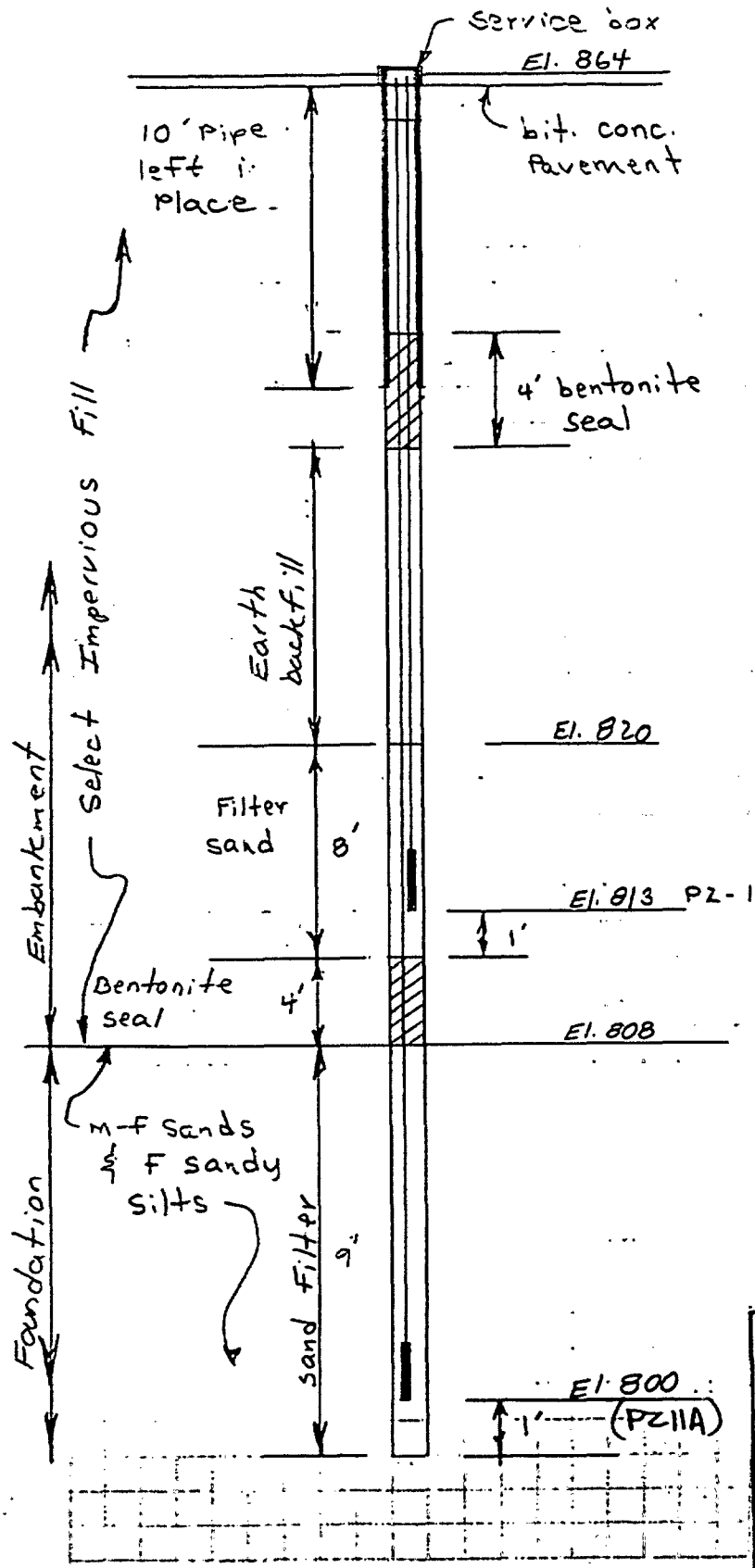
NEW ENGLAND DIVISION
CORPS OF ENGINEERS, U.S. ARMY

PAGE

SUBJECT Birch Hill Dam, MA

COMPUTATION Piezometer Installation, PZ-11 A & B, Sta. 7+00

COMPUTED BY EF CHECKED BY DATE 28 July 37



Notes:

1. 6 in. ID hole to El. 812
   4 in. ID hole below El. 812
2. Sampling:
   a. El. 864 to 820 - No Sample
   b. El. 820 to bottom of hole - continuous samples.

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY
DR. BY
CK. BY

BIRCH HILL DAM
PIEZOMETER INSTALLATION

GEOTECH. ENG. BR. SCALE:
SK. NO. ATTACH 6 DATE:

NED FORM 223
27 Sept 49

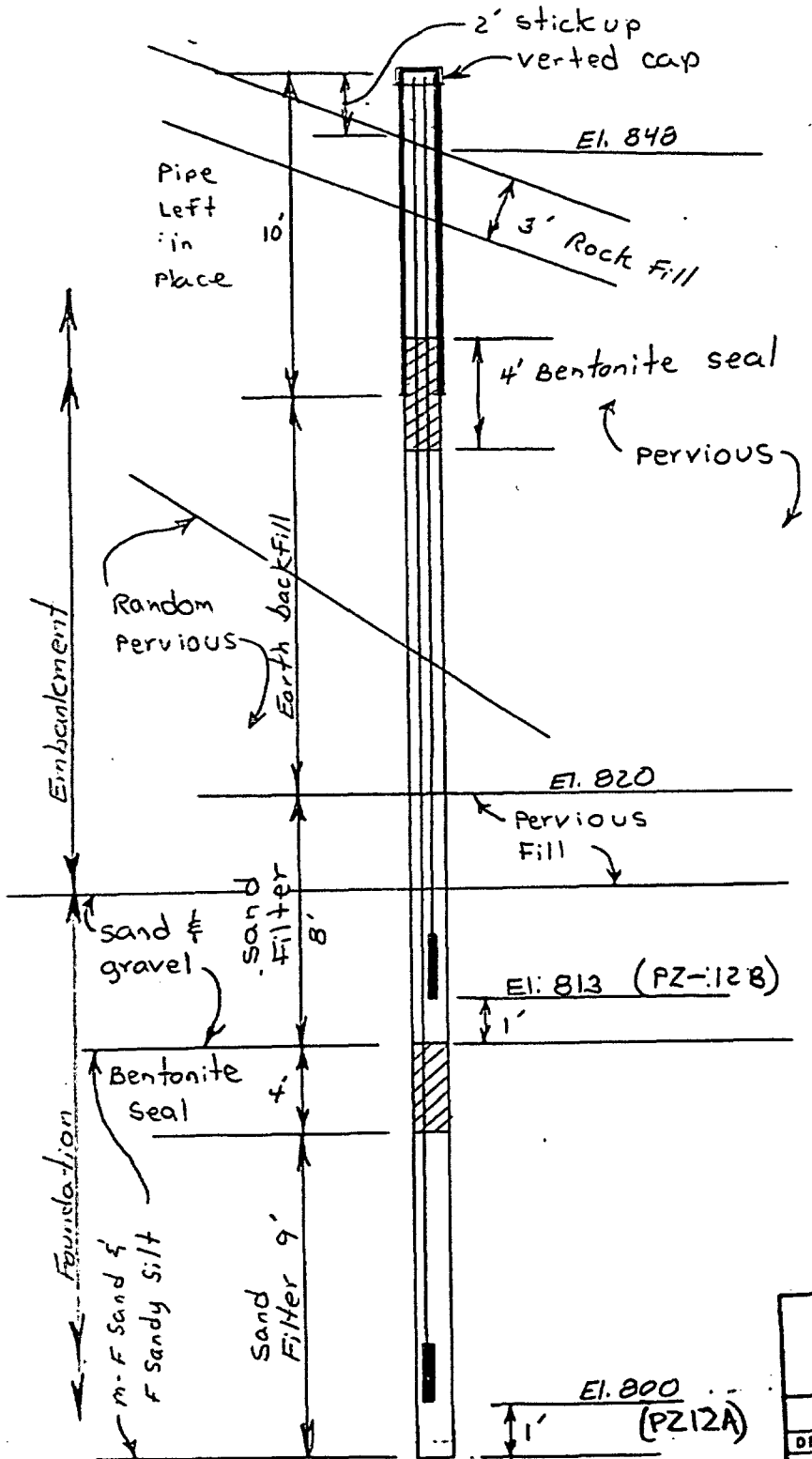
NEW ENGLAND DIVISION
CORPS OF ENGINEERS, U.S. ARMY

PAGE _____

SUBJECT Birch Hill Dam, MA

COMPUTATION Piezometer Installation, PZ-12 A&B, Sht 1 of 1

COMPUTED BY EC CHECKED BY _____ DATE 23 July 71



NOTES:

1. 6 in. ID hole to El. 812
   4 in. ID hole below El. 812.
2. Sampling:
   a. El. 848 to 820 - No sample req'd.
   b. El. 820 to bottom of hole continuous samples

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY
DR. BY
CK. BY

BIRCH HILL DAM
PIEZOMETER INSTALLATION

GEOTECH. ENG. BR. SCALE:
SK NO ATTACH 7 DATE:

NEW ENGLAND DIVISION
CORPS OF ENGINEERS, U S ARMY

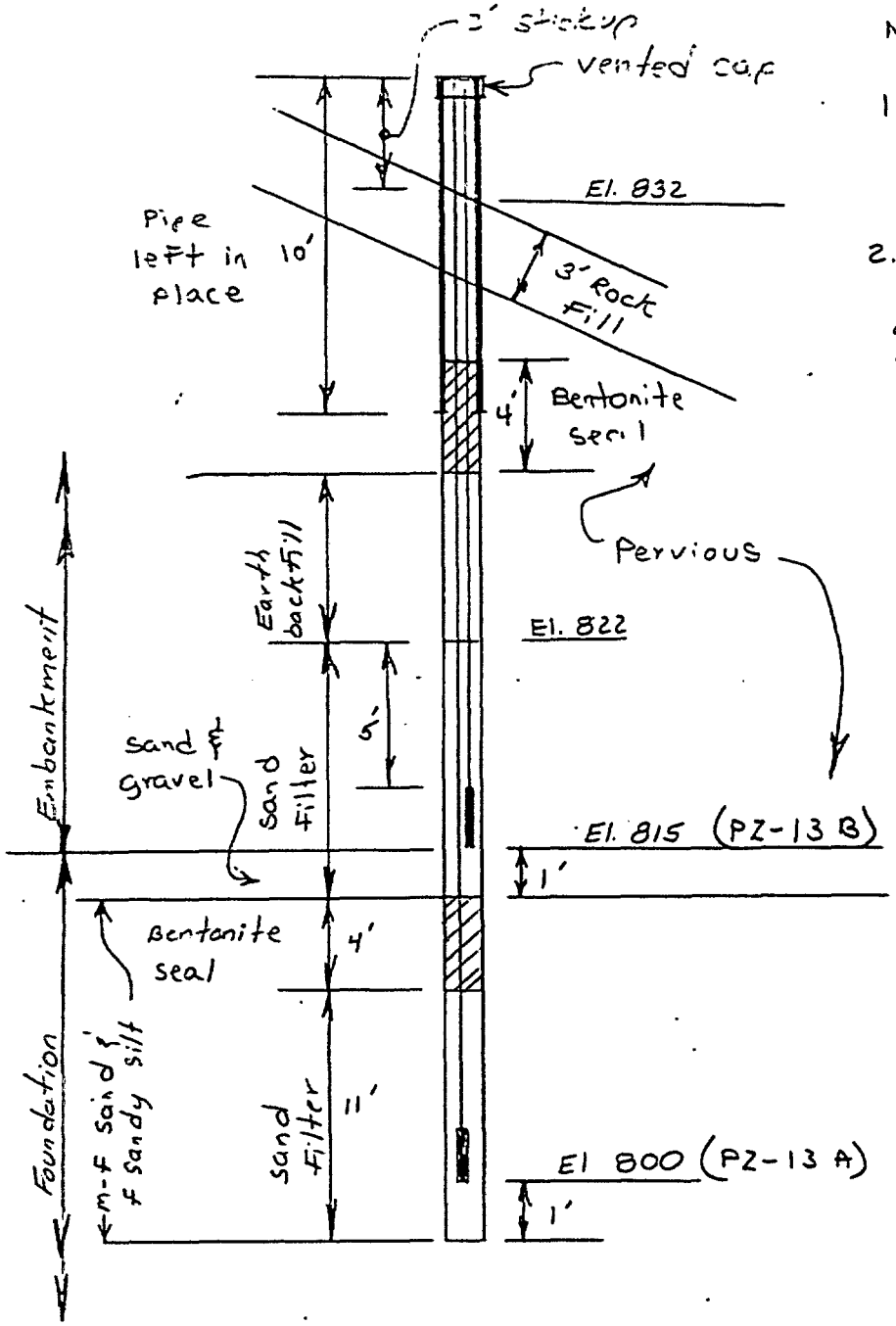
NEC FORM 223
27 Sept 49

PAGE

SUBJECT Birch Hill Dam, MA

COMPUTATION Piezometer Installation PZ-13 A & B, Sta 7+00

COMPUTED BY DF CHECKED BY DATE 28 July 99



NOTES:

1. 6 in. I.D. hole to El. 814
   4 in. I.D hole below El. 814.

2. Sampling:

   a. El. 832 to 822 - No Sample Rqd.
   b. El. 822 to Bottom of hole Continuous samples

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY
DR. BY
CK. BY

BIRCH HILL DAM
PIEZOMETER INSTALLATION

GEOTECH. ENG. BR. SCALE:
SK. NO. ATTACH 8 DATE:

NED FORM 223
27 Sept 49

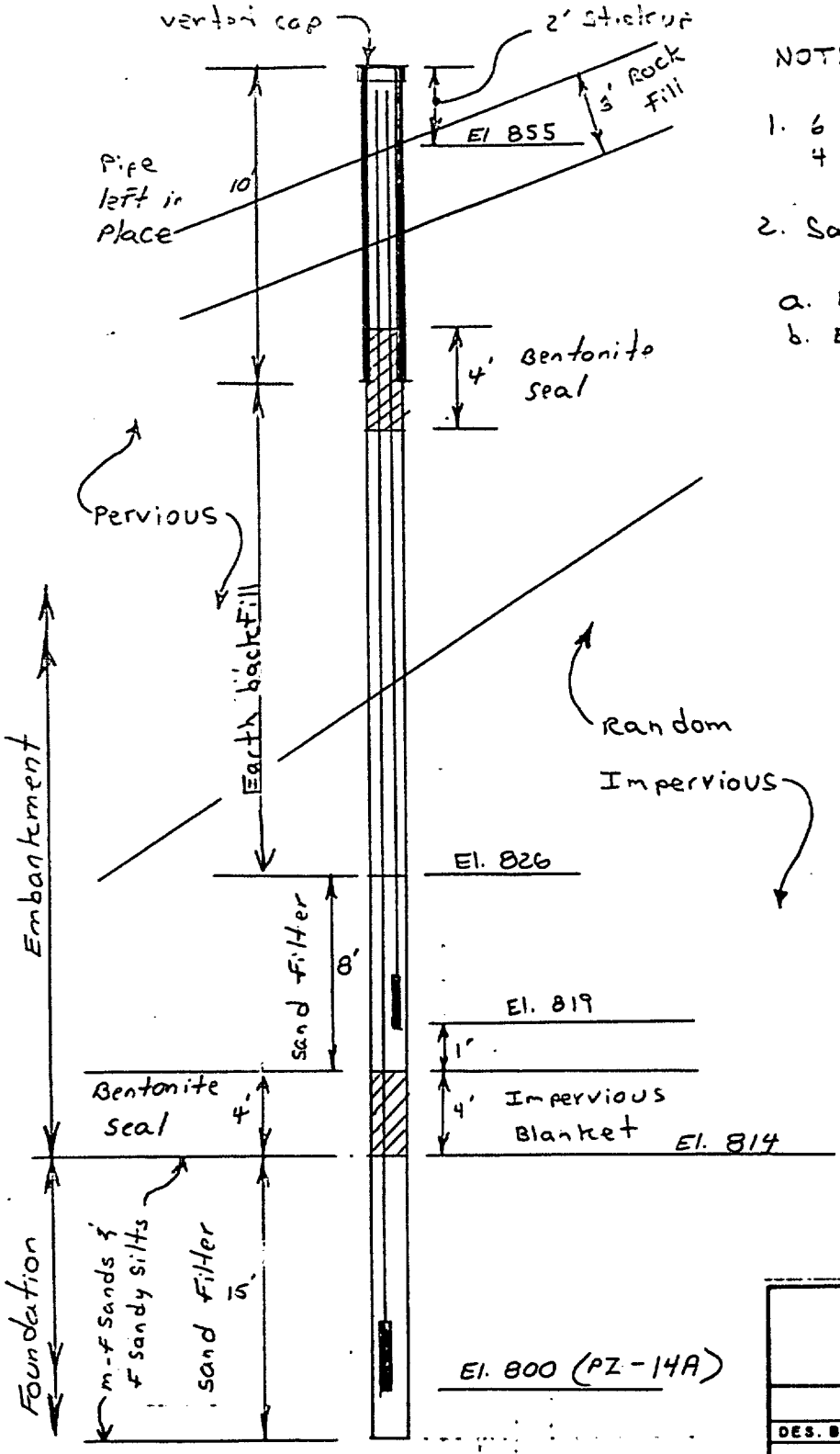
NEW ENGLAND DIVISION
CORPS OF ENGINEERS, U.S ARMY

PAGE _____

SUBJECT Birch Hill Dam, MA

COMPUTATION Foundation Investigation PZ-14 Sta 10+50

COMPUTED BY RF CHECKED BY _____ DATE 19 Jul 33



NOTES:

1. 6 in. ID hole to El. 826
   4 in. ID hole below El. 826
2. Sampling:
   a. El. 855 to 826 - No Sample
   b. El. 826 to bottom of hole continuous samples.

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY
DR. BY
CK. BY

BIRCH HILL DAM
PIEZOMETER INSTALLATION

GEOTECH. ENG. BR. SCALE:
SK NO ATTACH 9 DATE:

NEC FORM 223
27 Sept 49

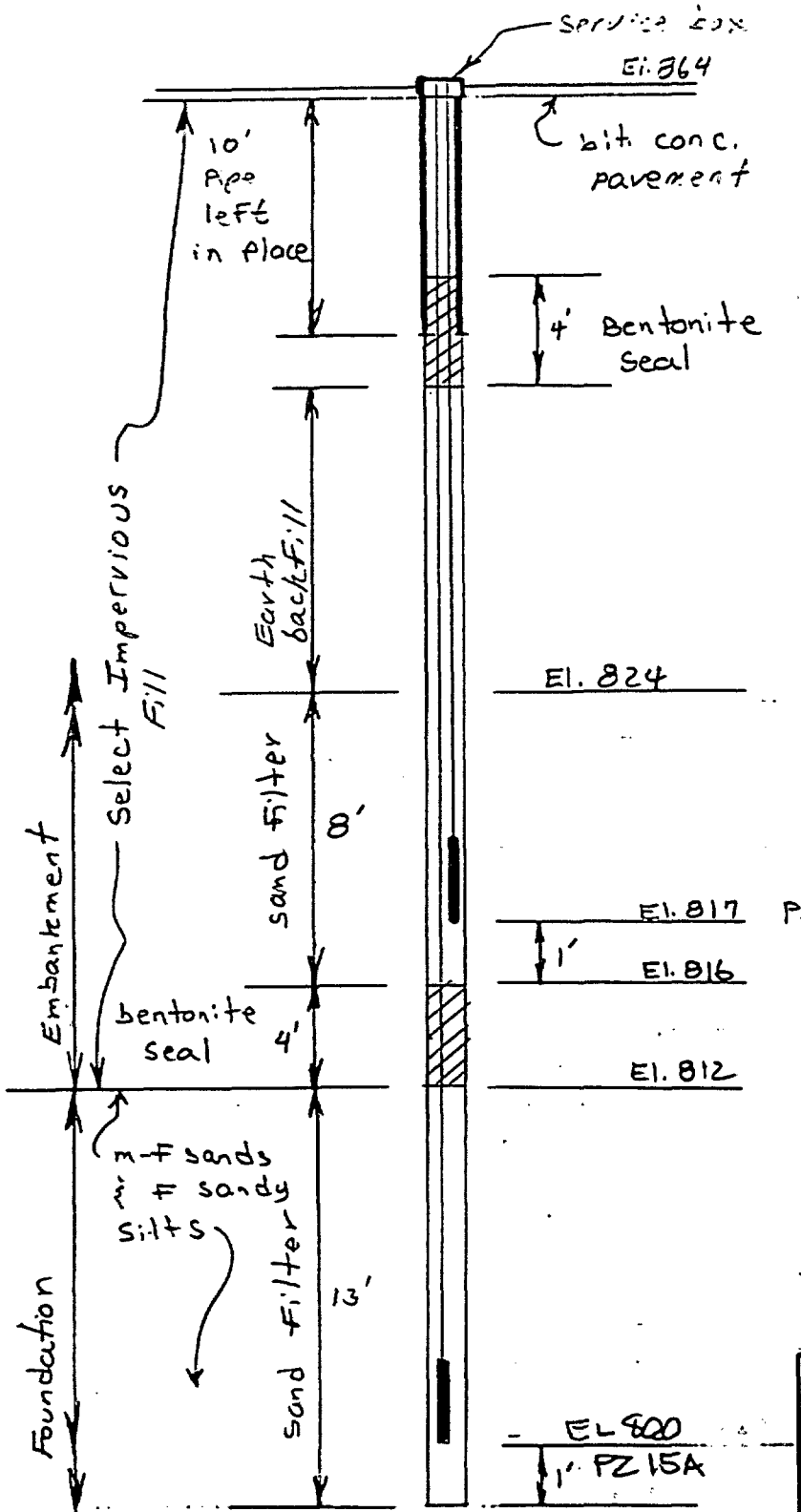
NEW ENGLAND DIVISION
CORPS OF ENGINEERS, U S ARMY

PAGE

SUBJECT Birch Hill Dam, MF

COMPUTATION Piezometer Installation, PZ-15 A&B, Sta 10+50

COMPUTED BY AE CHECKED BY DATE 13 Oct 55



NOTES:

1. 6 in ID hole to El. 816, 4 in ID hole below El. 816.
2. Sampling.
   a. El. 864 to 824 - No Sample,
   El. 824 to bottom of hole - continuous samples.

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY
DR. BY
CK. BY

BIRCH HILL DAM
PIEZOMETER INSTALLATION

GEOTECH. ENG. BR. SCALE:
SK. NO. ATTACH 10 DATE:

NED FORM 225
27 Sept 49

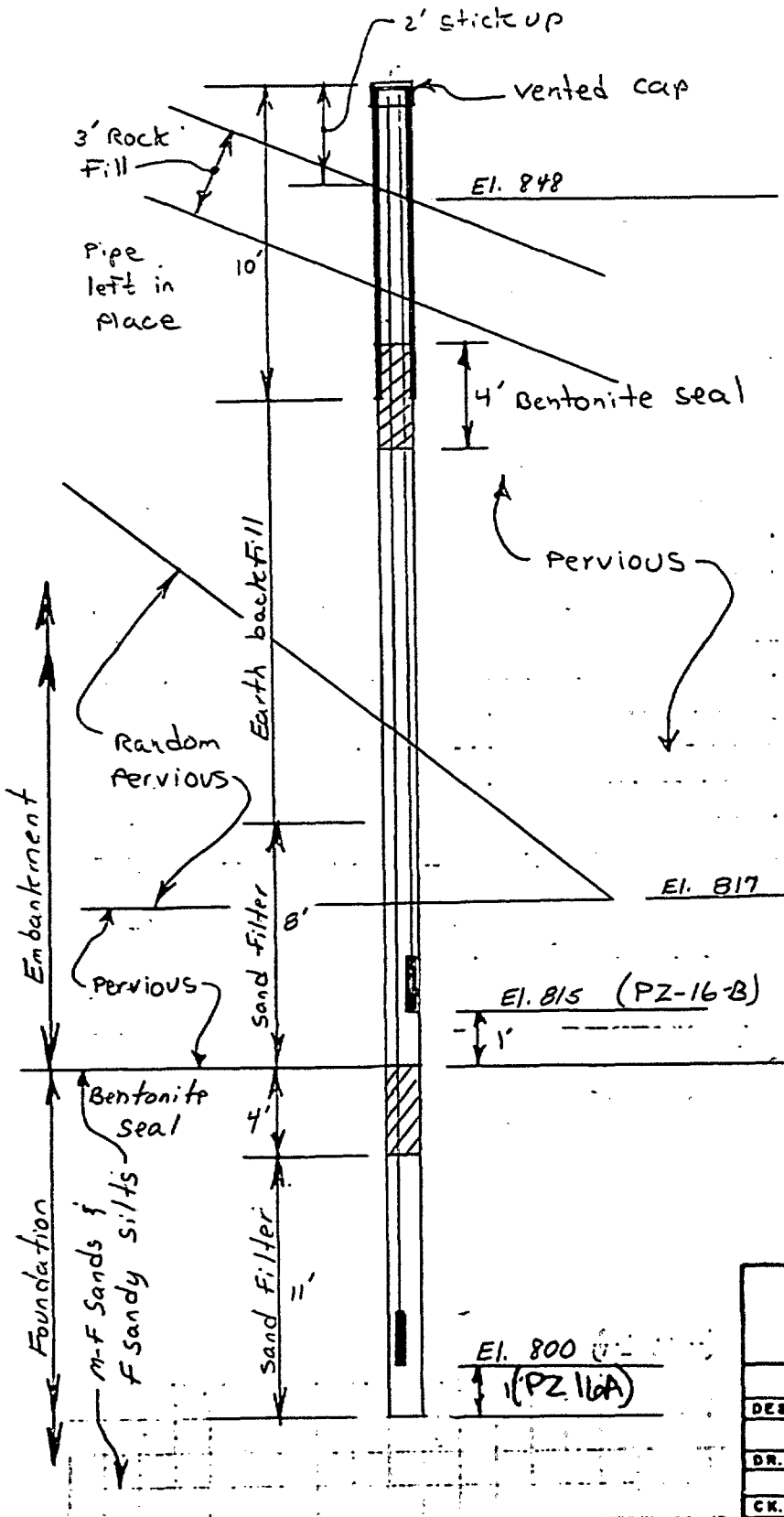
NEW ENGLAND DIVISION
CORPS OF ENGINEERS, U.S. ARMY

PAGE ____

SUBJECT Birch Hill Dam, MF

COMPUTATION Piezometer Installation, PZ-16 F E B, Sta. 10+50

COMPUTED BY ____ CHECKED BY ____ DATE 28 July 71



NOTES:

1. 6 in. ID. hole to El. 814
   4 in ID. hole below El. 814
2. Sampling:
   a. El. 848 to 822 - No Sample
   b. El. 822 to Bottom of hole - Continuous samples

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY
DR. BY
CK. BY

BIRCH HILL DAM
PIEZOMETER INSTALLATION

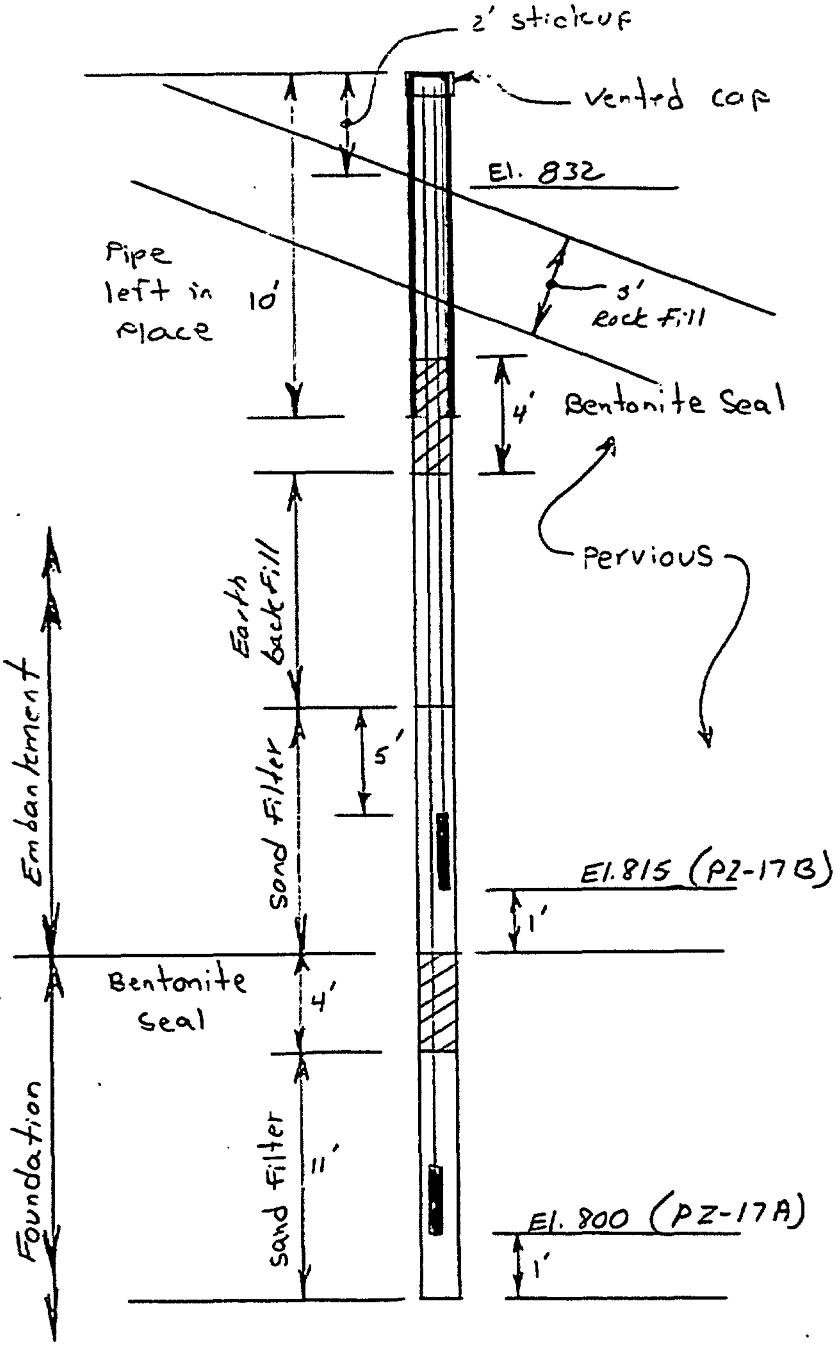
GEOTECH. ENG. BR. SCALE:
SK. NO Attach 11 DATE:

NED FORM 225
27 Sept 49

NEW ENGLAND DIVISION
CORPS OF ENGINEERS, U S ARMY

PAGE

SUBJECT Birch Hill Dam I/F
COMPUTATION Piezometer Installation PZ-17 A & B
COMPUTED BY
CHECKED BY
DATE 28 July 77



NOTES:

1. 6 in. ID hole to El. 814,
   4 in. ID hole below El. 814
2. Sampling:
   a. El. 832 to 822 - No Sample
   b. El. 822 to bottom of hole continuous samples.

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	BIRCH HILL DAM PIEZOMETER INSTALLATION
DR. BY	
CK. BY	
GEOTECH. ENG. BR.	SCALE:
SK. NO. ATTACH 12	DATE:

b. Project Site

The investigation took place on the left and right side of the earth dam at stations 7+00 and 10+50.

A General Plan, Piezometer Location Plan, three Cross Sections, and two Piezometer Installation Details are included in Section 8. These plans were provided to us in the Delivery Order. The project site is indicated on a portion of the Royalston, Mass-NH Quadrangle sheet of which a portion is reproduced and included on the following page.

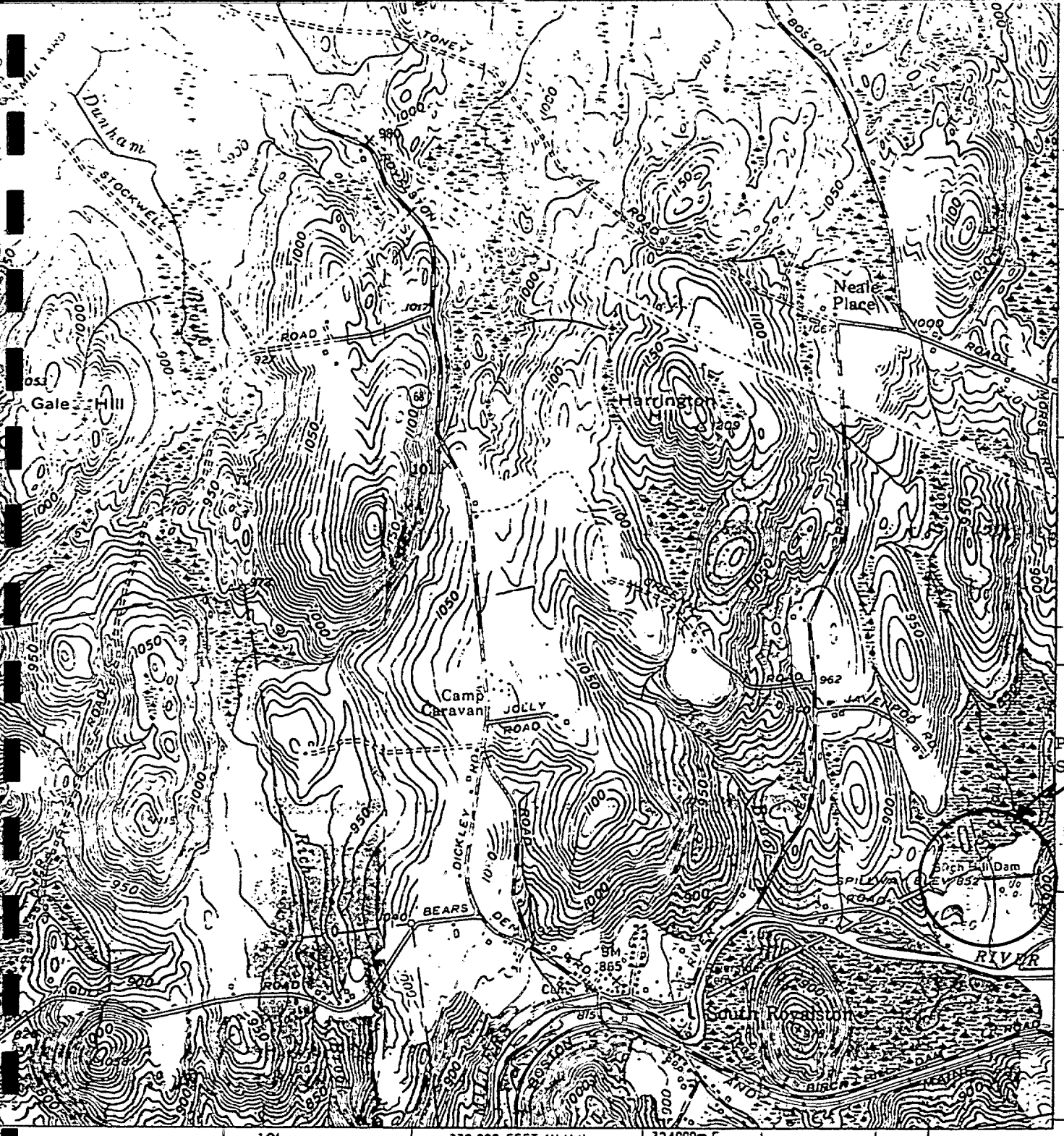
c. Purpose

The purpose of the explortion and piezometer installation was to provide information regarding the internal phreatic surface.

d. Scope of Work

Inspection and exploration instructions, which were provided by the Army Corps of Engineers, New England Division, in Delivery Order No. 0008, are included in Section 3a. General inspection, exploration, and piezometer installation instructions were provided by the Army Corps of Engineers, New England Division, through the contracted Geotechnical Exploratory Work Various Locations in New England. Specific instructions and changes during the course of the work were given verbally during on-site visits and telephone conversations with a USACE representative. All new instructions and changes can be found listed in Table I, Daily Activities and Table II, Telephone Log, both included in Section 5.

Drilling, sampling and piezometer installation was performed by Atlantic Testing Laboratories' personnel using Atlantic Testing Laboratories' equipment. The test borings were advanced and sampled as indicated on Attachment No. 1 of the Delivery Order (Section 3a) and as outlined in the contract specifications. Overburden sampling was performed using a 2 ft split spoon sampler (1-3/8" I.D.) and 140 lb hammer with a 30 inch drop.



INTERIOR—GEOLOGICAL SURVEY WASHINGTON D C—1962
MP 2647

MILE

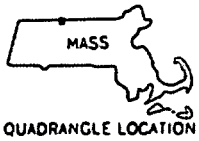
6000 7000 FEET

ROAD CLASSIFICATION

Medium-duty — Light-duty

Unimproved dirt

State Route



QUADRANGLE LOCATION

ROYALSTON, MASS.—N. H.

N4237.5—W7207.5/7.5

1954

Y STANDARDS
GTON 25, D. C.
VAILABLE ON REQUEST

SECTION 4

QUALITY CONTROL

a. General Certification Statement

I hereby certify that the records, equipment and procedures mentioned below were used to perform the subsurface exploration described herein. I also certify that the work was performed in a professional manner and meets the requirements set forth in the Delivery Order. This report has been subject to my review and is both complete and technically accurate.

CERTIFIED December 21, 1988

Spencer F. Thew, P.E./L.S.

b. Records Taken

Pertinent drilling procedures, sampling operations, and soil classifications were noted on the following forms provided for use by the Corps of Engineers:

NED-121 Field Log of Test Boring, Summary
NED-58 & 58A Field Log of Test Boring
NED-59 Subsurface Water Observations and Boring Location Sketch

Information outlining installed piezometer characteristics were noted on the Piezometer Installation Report and the Piezometer Installation Detail. A completed series of Field Logs, the Piezometer Installation Report, Subsurface Water Observation, Boring Location Sketch, and Piezometer Installation Detail are included in Section 8.

Sample containers were labeled using ATL sample labels. The samples were accepted by Tony Firicano, USACE, on the Birch Hill Dam site on November 22, 1988.

A summary of Daily Activities and Telephone Logs are Tables I and II of Section 5. A chain of custody log is included in Section 6. The Safety Meeting Reports (NED 251), including the exposure time for ATL are included in Section 7.

c. Equipment Used

A listing of all pertinent equipment and supplies provided by Atlantic Testing Laboratories, Limited.

Drilling equipment:
- CME 45 skid mounted drill rig
- CME 75 truck mounted drill rig
- CME 850 ATV drill rig
- SW (6") casing with drive and spin shoes
- drill rod - 2 ft, 5 ft and 10 ft lengths used for sampling and turning 5-5/8" roller bits
- 1-1/2" and 3" centrifugal pumps with 200 ft of fire hose and 300 ft of 1-1/2" black plastic pipe
- split spoon samplers, 2" O.D. x 2' in length
- three 100 gallon stock tanks

Piezometer supplies:
- Casagrande piezometer 1" ID x 2' in length
- threaded 3/4" ID scheduled 80 PVC riser pipe in 10 ft lengths
- filter sand, No. 4 in 100# bags
- Bentonite well seal, 3/8" diameter peltonite pellets
- backfill material was either No. 4 filter sand or original material from the bore hole

Piezometer test equipment:
- 200 ft electronic water level indicator (RocTest Model CPR4)
- standard watch with stopwatch function

Excavation equipment:
- M-F 2244 dozer with operator

Subcontracted equipment:
- large tow truck on GMC general chassis

d. Procedures

1. Survey Procedures

- Horizontal Control - Third Order (Class I)

- Vertical Control - Third Order (Class I)

1. Sampling and Drilling Procedures

Eight (8) borings were performed at the Birch Hill Dam. Two (2) piezometers were installed in all eight (8) of the borings. The field exploration included drilling and soil sampling followed by piezometer installation and testing.

Soil sampling techniques as described in the Contract Delivery Order involved retrieving material using the Standard Penetration Test. A 1-3/8" ID by 2 ft long spoon was driven the length of the spoon or until refusal was encountered. The blow counts were recorded for eaoh 6" of advancement. Samples were classified in the field in accordance with ASTM D-2488. Samples were taken from each soil sampling run and placed in either 16 oz or 32 oz jars with hermetically sealed lids. A chain of custody log was maintained to document custody of samples between ATL and the USACE.

The CME 45, 75 and 850 drill rigs were equipped to handle several different methods of drilling. Different techniques for advancing each hole, in conjunction with sampling were employed to best suit the situation. These systems are generally described as follows:

- SW (6) drive casing driven with 300# hammer with 24" drop.
- Auger drilling followed by driving SW (6") casing to desired depth.
- SW (6") spin casing preceded by a 5-5/8" roller bit when necessary to advance the casing.
- SW (6") spin casing until refusal is encountered; the hole was then advanced with 5-5/8" roller bit using Fluidrill drilling fluid to maintain open hole; the Fluidrill was deactivated by using Clorox.

2. After boring had been advanced to the required depth, filter sand was placed in the bottom of the hole to the specified depth. The 2 ft long porous plastic piezometer and 3/4" PVC riser pipe was lowered to the depth determined by the USACE.

Then No. 4 filter sand was added, followed by a 4 ft bentonite seal (3/8" peltonite pellets) at the specified depths. This procedure was done for each of two piezometers placed in each bore hole. The remainder of the hole above the upper piezometer was filled with either on site soils or filter sand. A 4" diameter pipe by 10 ft length of pipe was left in place around the 3/4" riser pipe for protection. The piezometer riser pipe protectors stand about 3 ft above ground. The piezometer was secured with a vented screw-on cap on the protective casing.

1. Piezometer Testing Procedures

A falling head test was performed on each piezometer after installation. This required pouring water down the pipe until it completely fills the riser and measuring the water level drop versus time. The depth was measured using an electronic water level indicator at the following scheduled time intervals: 0, 1, 5, 10, 30 minutes. However, in cases when the water dropped very rapidly, the time intervals were more closely spaced.

SECTION 5

SUMMARY OF DAILY ACTIVITIES
AND
TELEPHONE LOG

TABLE I
DAILY ACTIVITIES LOG

CD033 - BIRCH HILL DAM

Oct. 5, 1988 Wednesday	Todd Burnham, ATL driller on site 9:30 a.m. to 5:30 p.m. - Mobilized 2000 board ft of lumber to the site to construct platforms. - Started constructing platform at mid-slope (PZ-12) to support the skid mounted rig. - Constructing platform, one driller - 8 hrs.
Oct. 6, 1988 Thursday	Todd Burnham, ATL driller on site 8:00 a.m. to 2:30 p.m. - Completed construction of the drill platform at mid-slope (PZ-12). - Todd met with Tony Firicano, USACE, at noon, walked the site and reviewed the bore hole locations. - Constructing platform, one driller - 6.5 hrs.
Oct. 14, 1988 Friday	Todd Burnham and Scott Fox, ATL drillers on site 9:30 a.m. to 1:00 p.m. - Mobilized the CME 850 ATV to the dam site. - The drillers unloaded additional lumber and began positioning it for the second drill platform (PZ-13). - Constructing platform, two drillers - 3.5 hrs.
Oct. 17, 1988 Monday	Chris Lawrence, ATL Geologist on site 6:30 a.m. to 5:30 p.m. - Chris Lawrence met with Ed Lippman, USACE Assistant to Project Manager at Birch Hill Dam and made a site inspection. - Mobilized dozer and CME 75 truck mounted drill to site.
Oct. 18, 1988 Tuesday	Chris Lawrence, ATL Geologist; Paul Davis, Drilling Supervisor; Mike Hawkins, Paul McAloon, Todd Burnham, Shannon Hart, ATL drill crew on site 6:30 a.m. to 6:30 p.m. - Safety meeting held 6:45 to 7:15 a.m. - CME 850 began making access to set up on PZ-10 (FD-88-2). It was necessary to clear surface rocks to position CME 850 and place 3" stone fill. - First gravel truck arrived at 8 a.m.; gravel was bulldozed to make drilling platform for PZ-14 (FD-88-4) and PZ-10 (FD-88-2); 140 cy were used to construct platforms.

Oct. 18, 1988 Continued

- CME 75 began drilling PZ-11 (FD-88-1); advanced 6" (SW) casing to 64 ft; started sampling from 44 to 64 ft; terminated at 64 ft.
- Standby time for CME 850, 6:30 a.m. - 6:30 p.m., bore hole move to piezometer location on slope.
- Dozer on site 6:30 a.m. to 4:30 p.m.

Oct. 19, 1988
Wednesday

Chris Lawrence, ATL Geologist; Paul Davis, Drilling Supervisor; Mike Hawkins, Paul McAloon, Todd Burnham, Shannon Hart, ATL drill crew on site 6:30 a.m.to 7:00 p.m.

- At 6:30 a.m., CME 850 began PZ-10 (FD-88-2), spun casing to hole termination at 56 ft. Placed piezometers at depths of 44-46 ft and 53-55 ft. The upper piezometer (orange riser) and lower piezometer (grey riser). Chris Allie, USACE was on site and approved the new piezometer depth for the upper piezometer based on sample review.
- CME 75 cleaned hole to bottom of 6" casing at depth of 64 ft in PZ-11 (FD-88-1). Installed lower piezometer (grey riser) in bore hole at depth of 61-63 ft. The change in depth was approved by Chris Allie, USACE. Upper piezometer (orange riser) was installed at depth of 49-51 ft. Piezometer installation was completed, the 6" casing was removed and 4" protective pipe installed.
- CME 75 moved to PZ-15 (FD-88-3).

Oct. 20, 1988
Thursday

Chris Lawrence, ATL Geologist, on site 6:30 a.m. to 6:15 p.m.; Paul Davis, Drilling Supervisor; Mike Hawkins, Paul McAloon, ATL drill crew on site 6:30 a.m. to 5:15 p.m. Todd Burnham and Shannon Hart, ATL drill crew on site 7:15 a.m. to 7:15 p.m.

- CME 850 removed the 6" casing from PZ-10 (FD-88-2) and installed 4" protective pipe.
- The CME 850 then moved to PZ-14 (FD-88-4).
- CME 850 spent two hours clearing rocks so drilling could begin on PZ-14 (FD-88-4). Hole was advanced to approximately 29 ft.

- CME 75 completed bore hole PZ-15 (FD-88-3) and set the lower piezometer (grey riser) at a depth of 62 - 64 ft and upper piezometer (orange riser) at a depth of 45 to 47 ft.
- Drill crew drained water from rig and pumps as temperatures are expected to be below freezing tonight.
- Stand by time for CME 850 from 9 a.m. to 10:30 a.m. moving between bore holes and 2 hours clearing rocks.

Oct. 21, 1988
Friday

Chris Lawrence, ATL Geologist on site from 6:30 a.m. to 4:30 p.m.; Paul Davis, Drilling Supervisor on site 6:30 a.m. to 8:00 a.m. Mike Hawkins, Paul McAloon, ATL drill crew on-site 6:30 a.m. to 8:30 a.m.; Todd Burnham and Shannon Hart, ATL drill crew, on site 6:30 a.m. to 5:15 p.m.

- CME 850 drill crew thawed water lines and resumed drilling PZ-14 (FD-88-4) to a depth of 56 ft. Sampling was performed from 29 to 55 ft. Lower piezometer (grey riser) was installed at a depth of 53-55 ft. Upper piezometer (orange riser) placement was approved by Chris Allie, USACE, who was on site and initialed the change in depth on the log, from 34-36 ft to a depth of 40-42 ft. Pulled casing out of PZ-14 (FD-88-4) and installed protective pipe.
- CME 75 drill crew restored drill site from 6:30 to 8:00 a.m., and demobilized at 8:30 a.m.
- CME 850 drill crew restored drill site from 1:00 to 2:30 p.m., and demobilized at 6:30 p.m.
- Geologist left site approximately 1 p.m. to 4 p.m. to go to airport to pick up tractor trailer driver. Truck and trailer with rig departed site at 4:15 p.m. Drill crew remained to finish cleaning up the site.
- Dozer used to restore slope from 1-4 p.m.
- Standby time, CME 75 from 6:30 a.m. to 8:00 a.m.
- Standby time, CME 850 from 1:00 to 4:30 p.m.

Nov. 1, 1988
Tuesday

Chris Lawrence, ATL Geologist; Randy Todd and Rob Pryce, ATL drill crew, on site 9:45 a.m. to 4:30 p.m.

- CME 45 skid rig mobilized to site to perform midslope and toe piezometer installations.

- CME 45 skid rig was winched down the slope towards platform on PZ-12 (FD-88-5). Wrecker to aid in positioning drill rig was on site from 2:00 to 4:00 p.m. Heavy rain all day.
- Standby time, 9:45 a.m. to 4:30 p.m.

Nov. 2, 1988
Wednesday

Chris Lawrence, ATL Geologist; Randy Todd and Rob Pryce, ATL drill crew on site 7 a.m. to 4:45 p.m.

- Set CME 45 drill rig on platform and carried drill equipment and pumps to drill location (PZ-12).
- Standby time, 7:00 a.m. to 4:45 p.m.

Nov. 3, 1988
Thursday

Chris Lawrence, ATL Geologist; Randy Todd and Rob Pryce, ATL drill crew on site 7 a.m. to 5 p.m.

- Advanced 6" (SW) casing to 25 ft in PZ-12 (FD-88-5). Had difficulty going through surface rocks (used 4x5-1/2" core to get through surface rocks).

Nov. 4, 1988
Friday

Chris Lawrence, ATL Geologist; Randy Todd and Rob Pryce, ATL drill crew on site 6:30 a.m. to 12:45 p.m.

- Crew had to thaw pipes before drilling. Began sampling at 28 ft in PZ-12 (FD-88-5). Advanced casing to 30 ft.

- Terry Wong, USACE was on site. He reviewed the samples from the first four holes along with the logs and found everything satisfactory.

Nov. 7, 1988
Monday

Chris Lawrence, ATL Geologist on site from 1 p.m. to 5:30 p.m. Randy Todd and Rob Pryce, ATL drill crew on site 2:45 p.m. to 5:30 p.m.

- Advanced PZ-12 (FD-88-5) to 32 ft.
- Safety meeting held from 5 to 5:30 p.m.

Nov. 8, 1988
Tuesday

Chris Lawrence, ATL Geologist; Randy Todd and Rob Pryce, ATL drill crew on site 6:30 a.m. to 5:30 p.m.

- Sampled PZ-12 (FD-88-5) to 50 ft.
- Tony Firicano, USACE, arrived on site 1:40 p.m. Yellow-brown sand was encountered lower in the bore hole than expected; Tony Firicano agreed we should sample 48 - 50 ft and drill to 51 ft.

- Lower piezometer (grey riser) was installed from 48 to 50 ft and upper piezometer (orange riser) was installed from 40 - 42 ft. Began pulling casing with considerable difficulty.
- Began building platform to PZ-13 (FD-88-6) from 3:30-5:30 p.m.
- Standby time 3:30-5:30 p.m.

Nov. 9, 1988
Wednesday

Chris Lawrence, ATL Geologist; Randy Todd and Rob Pryce, ATL drill crew on site 6:30 a.m. to 5:30 p.m.

- Finished pulling casing for PZ-12 (FD-88-5) and set 4" protective pipe from 6:30-7:30 a.m.
- Finished building platform for PZ-13 and began mobilizing drill equipment down slope from 7:30 a.m. to 5:30 p.m.
- Wrecker on-site from 1:30 to 5 p.m. to assist in bore hole move to PZ-13 (FD-88-6).
- Standby time for CME 45, 7:30 a.m. to 5:30 p.m.

Nov. 10, 1988
Thursday

Chris Lawrence, ATL Geologist; Randy Todd and Rob Pryce, ATL drill crew on site 6:40 a.m. to 5:30 p.m.

- Began drilling PZ-13 (FD-88-6). Began sampling at depth of 10 ft; encountered obstruction at 18 ft; lost water circulation and had to spin casing to 20 ft; resumed sampling to bottom of hole at 34 ft.

Nov. 11, 1988
Friday

Chris Lawrence, ATL Geologist; Randy Todd and Rob Pryce, ATL drill crew on site 7 a.m. to 3 p.m.

- Cleaned bore hole PZ-13 (FD-88-6) to prepare for piezometer installation. Installed lower piezometer (grey riser) from 31 to 33 ft and upper piezometer (orange riser) from 23 to 25 ft. Pulled 6" (SW) casing and set 4" protective pipe.
- Moved drill equipment to bottom of slope and dismantled platform from 10 a.m. to 3 p.m.
- Standby time, 10 a.m. to 3 p.m.

Nov. 14, 1988
Monday

Chris Lawrence, ATL Geologist; Randy Todd and Rob Pryce, drill crew, on site 1:00 to 5:30 p.m.

- Crew left site to get new winch cable and returned to repair rig.
- Drill crew worked on platform for PZ-16 (FD-88-7).
- Safety meeting held from 6:30-7:00 p.m.
- Standby time, 3:30 to 5:30 p.m.

Nov. 15, 1988
Tuesday

Chris Lawrence, ATL Geologist and Randy Todd and Rob Pryce, ATL drill crew, on site 7 a.m. to 5:30 p.m.

- Continued building drill platform and moved drill rig and equipment to PZ-16 (FD-88-7). Had to purchase more 4x6 beams in order to raise the platform height.
- Tow truck on site from 12:30 to 5 p.m. to assist in moving skid rig. Rig was stuck in the rocks and some damage was done to the right skid. Rig was placed on platform at PZ-16 (FD-88-7).
- Standby time, 7 a.m. to 5:30 p.m.

Nov. 16, 1988
Wednesday

Chris Lawrence, ATL Geologist and Randy Todd and Rob Pryce, ATL drill crew on site 7 a.m. to 5 p.m.

- Began drilling PZ-16 (FD-88-7). Advanced 6" (SW) casing to 32 ft; sampled from 26 - 32 ft.

Nov. 17, 1988
Thursday

Chris Lawrence, ATL Geologist and Randy Todd and Rob Pryce, ATL drill crew on site 7 a.m. to 5:30 p.m.

- Advanced PZ-16 (FD-88-7) to 49 ft. Set lower piezometer (grey riser) from 46 to 48 ft and upper piezometer (orange riser) from 34 to 36 ft.

Nov. 18, 1988
Friday

Chris Lawrence, ATL Geologist and Randy Todd and Rob Pryce, ATL drill crew on site 7 a.m. to 5:30 p.m.

- Finished setting the piezometers in PZ-16 (FD-88-7), pulled casingand installed protective pipe. Prepared to move the rig off the platform. Moved drill equipment to PZ-17 (FD-88-8) from 9 a.m. to 5:30 p.m.

- Randy Todd asked if we could move drill hole PZ-17 (FD-88-8) 5 ft to the left of the stake as it was impossible to place the rig on the designated spot because of large rocks. Chris called Tony Firicano, USACE, and explained the situation. Tony agreed to the move.
- Tow truck on site 3 to 5 p.m. to move rig to platform on PZ-17 (FD-88-8).
- Standby time, 9 a.m. to 5:30 p.m.

Nov. 19, 1988
Saturday

Chris Lawrence, ATL Geologist and Randy Todd and Rob Pryce, ATL drill crew on site 6:30 a.m. to 5:30 p.m.

- Drilled PZ-17 (FD-88-8) to 10 ft where we begin sampling. Hit obstruction and drilled for about 1-1/2 hours, top of obstruction at 14', bottom at about 17 ft. Sampled to 32 ft; carried hole to 34 ft.

Nov. 20, 1988
Sunday

Chris Lawrence, ATL Geologist and Randy Todd and Rob Pryce, ATL drill crew on site 7 a.m. to 5:30 p.m.

- Lower piezometer (grey riser) was set from 31 - 33 ft and upper piezometer (orange riser) from 22 - 24 ft in PZ-17 (FD-88-8), casing was pulled and protective pipe installed. Began dismantling platform and moving drill equipment from 12:30 - 5:30 p.m.
- Standby time, 12:30 p.m. to 5:30 p.m.

Nov. 21, 1988
Monday

Chris Lawrence, ATL Geologist on site 6:30 a.m. to 8:30 a.m. and 2:00 p.m. to 5:30 p.m.; Randy Todd and Rob Pryce, ATL drill crew on site 6:30 a.m. to 7:30 a.m. and 11:30 a.m. to 5:30 p.m.

- Safety meeting held 6:30 to 7 a.m.
- Tow truck on site from 11:45 a.m. to 1 p.m. to move rig off PZ-17 (FD-88-8) and onto trailer.
- Drill crew finished dismantling platform, moving equipment to top of dam.
- Two falling head tests were run.
- Standby time, 7 a.m. to 5:30 p.m.

Nov. 22, 1988 Tuesday	Chris Lawrence, ATL Geologist on site 6:30 a.m. to 2:00 p.m. Randy Todd and Rob Pryce, ATL drill crew on site 6:30 a.m. to 6:30 p.m. - Drilled holes to replace guard rail posts, stretched cable and finished securing the site. Started loading drill trucks. 4 - 6 p.m. - Standby time, 6:30 a.m. to 4 p.m.
Nov. 23, 1988 Wednesday	- Randy Todd and Rob Pryce, ATL drill crew, demobilized from project.
Dec. 15, 1988 Thursday	Survey crew on site determining piezometer locations and elevations. Surveyors took static water readings in piezometers.

TABLE II

TELEPHONE ACTIVITY LOG

CD033 - BIRCH HILL DAM

Oct. 3, 1988 Monday - Thomas Pahler, ATL to Anthony (Tony) Firicano, USACE at 10:30 a.m.

Tom told Tony that we are preparing to mobilize to the project site this week and are preparing drill platforms. Tom inquired whether it would be acceptable to construct gravel road to access PZ-10, PZ-12, PZ-14 and PZ-16 from the top of the dam. The lower piezometers would be accessed from the bottom with a skid rig and the upper piezometers will be drilled with an ATV. The gravel road is proposed to be left in place for subsequent piezometer monitoring purposes. The gravel and grading cost could be taken care of by the Corps which would present a savings in tow truck charges.

Tony expressed concern with regard to gravel, he seemed to prefer crushed stone - told him it was his option. He said he would have to contact Dam or Project Manager to determine feasibility and who would pay for the stone.

Tom told him that we would like to know ASAP so we can prepare for the project. Tony said he would call back later today.

- Spencer Thew, ATL to Ron DeFilippo, USACE at 1:00 p.m.

Spencer mentioned to Ron that Tom Pahler had been talking to Tony Firicano regarding the possibility of putting gravel fill down the slope at the four (4) boring locations that are within about 35 ft of the top of the slope. Spencer told Ron that the gravel would be about 10 ft wide and extend down to the piezometer locations. Spencer felt that the offset in cost between standby and the cost of gravel would be break even or result in a slight savings for the Corps. Ron said that they had been discussing this in the office and he would get back to Spencer when he had an answer.

- Thomas Pahler, ATL to Anthony (Tony) Firicano, USACE at 2:30 p.m.

Tony said we can go ahead with road construction to piezometer locations. Payment will probably be taken out of our tow truck item.

Tom said we'd like to make the site arrangements around Wednesday, but would be in contact for confirmation. Tony would like to show whoever is on site the piezometer locations.

Oct. 4, 1988 Tuesday - Spencer Thew, ATL to James Bacon, Project Manager, Birch Hill Dam, USACE (508/249-4467) at 4:00 p.m.

Spencer left a message on the answering service that our drillers would be on site between 8:00 a.m. and 10:00 a.m. on Wednesday, October 5, 1988, to begin constructing drilling platforms and working on bore hole access.

Oct. 5, 1988 - Thomas Pahler, ATL to Anthony (Tony) Firicano, USACE at 8:45 a.m.

Tom called Tony regarding notification of mobilization initiation and site preparation for drill rigs. Todd Burnham, a driller, will be on-site at about 10:00 a.m. to begin constructing drilling platform for skid rig.

Tony said he may not be able to go out to the site today, but may be able to tomorrow. Tom told him that Todd will probably call in and at that time will determine what the itinerary is for the balance of the week.

Tom will call Tony again later on this date to inform him of the week's schedule and proposed activities.

- Paul Hersom, USACE to Spencer Thew, ATL at 9:35 a.m.

Paul was returning Spencer's call to Jim Bacon on October 4, 1988. Spencer indicated that our drillers would be on-site about 10:00 a.m. Paul indicated that he would wait until our drillers arrived.

- Todd Burnham, ATL to Spencer Thew, ATL at 12:30 p.m.

Todd is on-site and has met with Paul Hersom, USACE. Paul indicated that Tony Firicano would be on-site tomorrow at about 12:00 noon. Todd indicated that they would start platform construction for access to the bore holes at the toe of the dam.

Oct. 12, 1988 Wednesday - Anthony (Tony) Firicano, USACE to Deanna Hadfield, ATL at 10:35 a.m.

Tony questioned the schedule of the drillers. His Project Manager called him earlier in the morning and said he has not seen anyone.

Deanna told Tony that as soon as she heard from someone, she would call him with status report.

- Jennie Mason, ATL to Anthony (Tony) Firicano, USACE at 2:14 p.m Mr. Firicano was away from his desk. Left a message to please return the call.

- Anthony Firicano, USACE to Jennie Mason, ATL at 2:30 p.m. Jennie relayed a message to Mr. Firicano from Spencer Thew that we were waiting for a shipment of 6" casing to come in before we could begin drilling. We have ordered the casing to come as soon as possible. Mr. Firicano was told that the drillers would be on-site Monday morning. Mr. Firicano asked that the Inspector notify the Corps when they arrive on-site.

Oct. 17, 1988 Monday - Spencer Thew, ATL to Ed Lippman, USACE, Assistant to the Project Manager at Birch Hill Dam at 8:00 a.m.

Spence indicated to him that the drillers would be on-site later this afternoon and that our Geotechnical Inspector would be there early this morning. Mr. Lippman indicated that he had already met the Geotechnical Inspector at about 6:30 a.m.

- Spencer Thew, ATL to Anthony Firicano, USACE at 8:00 a.m.

Anthony was not in so Spence talked to Tim Bouckman and asked Tim to relay the message to Tony that our Geotechnical Inspector was currently on-site and that our drillers would be on-site this afternoon and that we had mobilize the CME 850 to the site on Friday.

Oct. 18, 1988 Tuesday - Chris Lawrence, ATL Geologist to Chris Alley USACE at 1 p.m.

Informed Chris Allie that we started drilling today as he wanted to visit the site. Chris Allie said he would visit the sight either Wednesday or Thursday of this week.

Anthony Firicano will be out of the office this week so Chris Allie is our daily contact at the Corps office.

Oct. 20, 1988 - Thursday

Chris Lawrence, ATL Geologist to Chris Alley, USACE at 2:30 p.m.

Chris informed Chris Alley of drilling progress - completed PZ-11 (FD-88-1) and PZ-10 (FD-88-2), filling the hole on PZ-15 (FD-88-3) and drilling only about 15' down on PZ-14 (FD-88-4). Mr. Alley instructed Chris that if we find yellowish sand and gravel as in PZ-10 (FD-88-2), we should move the upper piezometer down to a depth of one foot above the bottom of the yellowish layer. If the layer is less than 4 ft thick or non-existent, then follow the original diagram.

Oct. 24, 1988 - Monday

Spencer Thew, ATL to Yuri Yatsevitch, USACE at 8:30 a.m.

Spencer called Yuri and told him that we would be moving the CME 45 skid-rig to the dam site on Friday afternoon (10/28). We do not anticipate working Friday afternoon, however, would be set up to start Monday morning.

Spencer indicated that the work last week with the CME 75 and the CME 850 had gone more rapidly than anticipated. Spencer told Yuri that we had originally planned that the CME 75 and CME 850 would be completed on Wednesday, October 26, 1988. Once they were done, we could begin the slope holes with the CME 45. Yuri indicated that taking a week's break in the field would not create a problem as far as their schedule is concerned.

October 31, 1988 - Monday

Chris Lawrence, ATL Geologist to Tony Firicano, USACE at 8:30 a.m.

Chris Lawrence called Tony Firicano to inform him that our equipment should arrive on site today. The drill crew should begin setting up between 7 and 8 a.m. on Tuesday. This was acceptable.

If Tony Firicano is not in when the ATL representative places his daily progress report call, Terry Wong will be available.

November 1, 1988 - Tuesday

Chris Lawrence, ATL Geologist to Chris Alley, USACE at 1:00 p.m.

Chris Lawrence spoke with Chris Alley as Tony Firicano was not available today. ATL crew is on location and setting up equipment on first hole.

Chris Lawrence inquired if we could use NW casing instead of HW casing on the lower portion of the drill hole when only a single piezometer would be set? Chris Alley approved this but said to invoice accordingly. NW casing was not subsequently used.

November 2, 1988 - Wednesday — Chris Lawrence, ATL Geologist to Chris Alley, USACE at 2:30 p.m.

Chris Lawrence confirmed that the upper piezometer is being placed 2 ft above the base of the yellow-brown sand. Chris Allie was in agreement.

November 3, 1988 - Thursday — Chris Lawrence, ATL Geologist to Terry Wong, USACE at 1:30 p.m.

Chris Lawrence informed Terry Wong that we were drilling PZ-12 (FD-88-5) and had reached a depth of 16 ft; drilling had been slow because of rocks. Terry Wong will probably be on site Friday morning (November 4).

November 7, 1988 - Monday — Chris Lawrence, ATL Geologist to Terry Wong, USACE at 3 p.m.

Chris Lawrence, ATL, informed Terry Wong, USACE, that ATL's crew was on site and would be finishing the drilling, sampling and piezometer placement on PZ-12 (FD-88-5) Tuesday, November 8. Terry said fine.

November 8, 1988 - Tuesday — Chris Lawrence, ATL Geologist to Terry Wong, USACE at 12:30 p.m.

Chris Lawrence called to inform Terry Wong that we had reached the bottom of the hole. Also, that the yellow-brown sand and gravel that in which the upper piezometer is set, came in at 38 - 42 ft; there would not be enought room to set both piezometers and the bentonite seal as on the specs. Terry Wong said sample to 50 ft and wash the hole to 51 ft. Also, Tony Firicano, USACE, would be out at the site around 1:30 p.m. Chris said we would go back and drill the extra 2 ft.

November 9, 1988 - Wednesday — Chris Lawrence, ATL Geologist to Tony Firicano, USACE at 1:45 p.m.

Chris Lawrence informed Tony Firicano that we had completed PZ-12 (FD-88-5) and were moving the rig to PZ-13 (FD-88-6). Tony mentioned that he wanted the bentonite in the curb boxes reduced so when it expanded, it did not go into the piezometers.

November 10, 1988 - Chris Lawrence, ATL Geologist to Tony Firicano, USACE at 2:15 p.m.
Thursday

Chris told Tony we began drilling PZ-13 (FD-88-6) and have sampled 10 - 18 ft. At 18 ft, we hit a boulder and have been unable to collect the 18 - 20 ft sample. The 6" casing goes to a depth of 10 ft with the rest open hole 6" and we are now spinning the casing to 20 ft and will then try to drill through the rock.

Tony also said that if we get through the rock and do not see the yellow sand and gravel, simply follow the original diagram. Place the upper piezometer about one foot above the bottom of the sand and gravel. Also, because there is a 4 ft bentonite seal at the top of the silty sand, if we need to go deeper to get the proper spacing, do so.

Finally, because of Veterans Day, there will be no one to call Friday, November 11, 1988.

November 15, 1988 - Chris Lawrence, ATL Geologist to Tony Firicano, USACE at 8:20 a.m.
Tuesday

Chris Lawrence told Tony Firicano that we set the piezometers in PZ-13 (FD-88-6) on Friday and began dismantling the platform and moving the rig to PZ-16 (FD-88-7). Chris said they may be drilling by late this afteroon. Tony thought he might be on location Thursday. Also, if possible, he would like to see the site prior to the crew's departure next week.

November 16, 1988 - Chris Lawrence, ATL Geologist to Tony Firicano, USACE at 1:30 p.m.
Wednesday

Chris Lawrence told Tony Firicano that we moved the rig on Tuesday and began drilling Wednesday morning. Tony informed Chris that he would be on-site Thursday, midday.

November 18, 1988 - Chris Lawrence, ATL Geologist to Tony Firicano, USACE at 12:30 p.m.
Friday

Chris Lawrence informed Tony Firicano that we were moving the rig today but that because of the large rocks on the PZ-17 (FD-88-8) site, we would like to move the hole 5 ft to the left looking down from the road but keeping it at the same elevation. Tony saw no problem and approved the move. He also said that I did not have to call him during the weekend unless there is a problem.

SECTION 6

CHAIN OF CUSTODY LOG

ATLANTIC TESTING LABORATORIES, Limited

CHAIN OF CUSTODY LOG
FOR
SOIL SAMPLES & ROCK CORES

Boring Logs: _____

Jar Samples: Birch Hill Dam

Rock Cores: _____

Tubes: _____

	DATE & TIME OF TRANSFER	FROM	TO	LOCATION	SIGNATURE OF RECEIVER
PZ10	11/22 10 jars	Chris Lawrence	Tony Fericano	Birch Hill Dam	
PZ-11	16 jars				
PZ12	11 jars				
PZ-13	13 jars				
PZ-14	15 jars				
PZ-15	12 jars				

ATLANTIC TESTING LABORATORIES, Limited

CHAIN OF CUSTODY LOG
FOR
SOIL SAMPLES & ROCK CORES

Boring Logs: _____

Jar Samples: Birch Hill Dam Project

Rock Cores: _____

Tubes: _____

DATE & TIME OF TRANSFER	FROM	TO	LOCATION	SIGNATURE OF RECEIVER
PZ-16 12 Jan	Chris Lawrence	Tony Fortunato	Birch Hill Dam	
PZ-17 11 Jan				

SECTION 7

SAFETY REPORTS

WEEKLY SAFETY MEETING

Date held 10/18/[illegible]

NEDSO

THRU: Area Engineer, _____ Area

Time 6:45 AM

TO: Safety Office, NED

Report No. 1

1. Weekly safety meeting was held this date for the following personnel:

Contract No. /D.O.No. 033 Contractor Atlantic Testing Laboratories Ltd.

Conducted By P. H. Lawrence All personnel present (Contr) 6 ATL
(Sub) _____
(Govt) _____

Subjects discussed (Note, delete, or add):
EM 385-1-1, Section: _____

Accident Prevention Plan -

Individual Protective Equipment - ✓

Prevention of Falls ✓

Back Injury, Safe Lifting Techniques - ✓

Fire Prevention - ✓

Sanitation, First Aid, Waste Disposal ✓

Tripping Hazards - trash, hose, nails in lumber ✓

Staging, Ladders, Concrete Forms, Safety Nets - N/A

Hand Tools, Portable Power Tools, Woodworking Machinery - ✓

Equipment Inspection & Maintenance (Zero Defects) - ✓

Hoisting Equipment - ✓

Ropes, Hooks, Chains and Slings - ✓

Electrical Grounding, Temporary Wiring, GFCI - ✓

Lockouts for safe clearance procedures - electrical, pressure, moving parts - ✓

Welding, Cutting - N/A

Excavations - ✓

Loose Rock and Steep Slopes - ✓

Explosives - N/A

Water Safety - N/A

Toxic materials - hazards, MSDS, respiratory, ventilation - N/A

Other -

Prepared by _____ Title _____

2. Forwarded.

Signature P. H. Lawrence
Resident Engineer

CF: EXPOSURE HOURS:
Work Date: _____
Non-work Date: _____

Man Hours:
Contr: 300
Subcontr: _____
Govt: _____
TOTAL: _____

NED, Form 251

WEEKLY SAFETY MEETING

Date held 11/7/88

NEDSO

Time 5:00-5:30

THRU: Area Engineer, ______________ Area

TO: Safety Office, NED

Report No. ________

1. Weekly safety meeting was held this date for the following personnel:

Contract No. /D.O.No. CP-033 Contractor Atlantic Testing Laboratories, Ltd.

Conducted By Chris Lawrence All personnel present (Contr) 3 (Sub) ____ (Govt) ____

Subjects discussed (Note, delete, or add):

EM 385-1-1, Section: ________

Accident Prevention Plan ✓

Individual Protective Equipment - ✓

Prevention of Falls ✓

Back Injury, Safe Lifting Techniques - ✓

Fire Prevention - ✓

Sanitation, First Aid, Waste Disposal ✓

Tripping Hazards - trash, hose, nails in lumber ✓

Staging, Ladders, Concrete Forms, Safety Nets - N/A

Hand Tools, Portable Power Tools, Woodworking Machinery - N/A

Equipment Inspection & Maintenance (Zero Defects) - ✓

Hoisting Equipment - ✓

Ropes, Hooks, Chains and Slings - ✓

Electrical Grounding, Temporary Wiring, GFCI - N/A

Lockouts for safe clearance procedures - electrical, pressure, moving parts - N/A

Welding, Cutting - N/A

Excavations - N/A

Loose Rock and Steep Slopes - ✓

Explosives - N/A

Water Safety - N/A

Toxic materials - hazards, MSDS, respiratory, ventilation - N/A

Other -

Prepared by Chris Lawrence Title Geologist

2. Forwarded.

Signature Christopher H. Lawrence
Resident Engineer

CF: EXPOSURE HOURS:
Work Date: ______________
Non-work Date: ______________

Man Hours:
Contr: 120
Subcontr: ________
Govt: ________
TOTAL: ________

NED Form 251

WEEKLY SAFETY MEETING

Date held 12/14/88

NEDSO

Time 6:30 - 7:00 p.m.

THRU: Area Engineer, Terry Fr[illegible] Area

TO: Safety Office, NED

Report No. ________

1. Weekly safety meeting was held this date for the following personnel:

Contract No. /D.O.No. CD-033 Contractor Atlantic Testing Laboratories Ltd.

Conducted By Chris Lawrence All personnel present (Contr) 3

(Sub) ________

(Govt) ________

Subjects discussed (Note, delete, or add):
EM 385-1-1, Section: ________

Accident Prevention Plan ✓

Individual Protective Equipment - ✓

Prevention of Falls ✓

Back Injury, Safe Lifting Techniques - ✓

Fire Prevention - N/A

Sanitation, First Aid, Waste Disposal ✓

Tripping Hazards - trash, hose, nails in lumber ✓

Staging, Ladders, Concrete Forms, Safety Nets - N/A

Hand Tools, Portable Power Tools, Woodworking Machinery - N/A

Equipment Inspection & Maintenance (Zero Defects) - ✓

Hoisting Equipment - ✓

Ropes, Hooks, Chains and Slings - ✓

Electrical Grounding, Temporary Wiring, GFCI - N/A

Lockouts for safe clearance procedures - electrical, pressure, moving parts - ✓

Welding, Cutting - N/A

Excavations - N/A

Loose Rock and Steep Slopes - ✓

Explosives - N/A

Water Safety - N/A

Toxic materials - hazards, MSDS, respiratory, ventilation - N/A

Other -

Prepared by Chris Lawrence Title Geologist

2. Forwarded.

Signature Chris Lawrence
Resident Engineer

3: EXPOSURE HOURS:
Work Date: ________
Non-work Date: ________

Man Hours:
Contr: 198
Subcontr: ________
Govt: ________
TOTAL: ________

NED Form 251

WEEKLY SAFETY MEETING

Date held 11/21/02

NEDSO

THRU: Area Engineer, Tony Fariciano Area

Time 6:30

TO: Safety Office, NED

Report No. _____

1. Weekly safety meeting was held this date for the following personnel:

Contract No. /D.O.No. CD-037 Contractor Atlantic Testing Laboratories Ltd.

Conducted By Chris Lawrence All personnel present (Contr) 3
(Sub) _____
(Govt) _____

Subjects discussed (Note, delete, or add):
EM 385-1-1, Section: _____

Accident Prevention Plan ✓

Individual Protective Equipment - ✓

Prevention of Falls ✓

Back Injury, Safe Lifting Techniques - ✓

Fire Prevention - N/A

Sanitation, First Aid, Waste Disposal ✓

Tripping Hazards - trash, hose, nails in lumber ✓

Staging, Ladders, Concrete Forms, Safety Nets - N/A

Hand Tools, Portable Power Tools, Woodworking Machinery - N/A

Equipment Inspection & Maintenance (Zero Defects) - ✓

Hoisting Equipment - ✓

Ropes, Hooks, Chains and Slings - ✓

Electrical Grounding, Temporary Wiring, GFCI - N/A

Lockouts for safe clearance procedures - electrical, pressure, moving parts - ✓

Welding, Cutting - N/A

Excavations - N/A

Loose Rock and Steep Slopes - ✓

Explosives - N/A

Water Safety - N/A

Toxic materials - hazards, MSDS, respiratory, ventilation - N/A

Other -

Prepared by Chris Lawrence Title Geologist

2. Forwarded.

Signature Chris Lawrence
Resident Engineer

CF: EXPOSURE HOURS:
Work Date: _____
Non-work Date: _____

Man Hours:
Contr: 75
Subcontr: _____
Govt: _____
TOTAL: _____

NED, Form 251

SECTION 8

FIELD INSPECTOR'S LOGS

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. CD-073

Site Birch Hill Dam

Page 1 of 9 Pages

Hole No. PZ-1 / FD-88-1 Diam. (Casing) 6" SW

Boring Started 10/12/88

Co-ordinates: N 594922 E 432140

Boring Completed 10/19/88

Drilled by Hawkins & Madden

Report Submitted 12/21/88

Purpose of Exploration Install 2 piezometers.

Elevation Top of Hole 264' M.S.L.

Total Overburden Drilled 64' Feet

Elevation Top of Rock ______ M.S.L.

Elevation Bottom of Hole 200 M.S.L.

Total Rock Drilled ______ Feet

Total Depth of Hole 64' Feet

Core Recovered ______ %

Core Recovered ______ Ft.: ______ Diam. ______ In.

Soil Samples 1 3/8 In. Diam. 10 No.

Soil Samples ______ In. Diam. ______ No.

Casing Left in Place Flush Mounted Curb Box Feet

Water Table Depth ≃ 47'

Depth From	Depth To	Method of Drilling and Type of Bit Used
0	64	Entire hole drilled with 6" SW Casing
0	44	No samples as per instructions
44	64	Continuous sampling
49	51	Upper piezometer (orange)
61	63	Lower piezometer (grey)

INDEX

Ground Water	Back of Page 3
Boring Location Sketch	Back of Page 3
Overburden Record page 2-6	Page
Rock Drilling	Page
Piezometer Installation Report	Page 7
" " Detail	Page 8
	Page

Prepared by Christopher H. Lawrence

Field Data

Lab. Data

Submitted by Atlantic Testing Laboratories

NED FORM DEC 63 121

REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site Birch Hill Dam Page 2 of 9 Pages

Boring No. P2-11 (FD-88-1) Desig. _____ Diam. (Casing) 6"

Co-ordinates: N 59-1922 E 432140

Elevation Top of Boring ~614 M.S.L.
Total Overburden Drilled 64 Feet
Elevation Top of Rock _____ M.S.L.
Total Rock Drilled _____ Feet
Elevation Bottom of Boring ~550 M.S.L.
Total Depth of Boring 64 Feet
Core Recovered _____ % No. Boxes _____
Core Recovered _____ Ft : _____ Diam. ____ In.
Soil Samples 1 3/8" In. Dia m. 10 No.
Soil Samples _____ In. Diam. ____ No.

Hammer Wt. 140 lbs
Hammer Drop 30"
Casing Left _____
Subsurface Water Data _____ Page 8
Obs. Well Piez
Drilled By Hawkins + McAloon
Mfg. Des. Drill _____
Inspected By: Christopher H. Lawrence
Classification By: Christopher H. Lawrence
Classification By: _____

Boring Started 10/11/88
Boring Completed 10/19/88

DEPTH	CORE/SAMPLE NO.	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RANGE	BLOWS PER FT. / CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
0					Entire hole drilled with 4 1/4" auger with the 6" SW flush coupled casing advanced with a 300 lbs hammer to 64'.	No samples above 4/4' as per instructions
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

GENERAL REMARKS:

Site: Birch Hill Dam

Boring No.: Pz-11 FD-88-1

DEPTH		CORE/SAMPLE			BLOWS PER FT. CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
	1'	NO.	SIZE	DEPTH RANGE			
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							

Site: Buck Hill Dam

Boring No.: P2-11 FD-88-1

Page 4 of 9

DEPTH (ft.)	CORE/SAMPLE NO.	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RUN	BLOWS PER FT. / CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						

Site: Birch Hill Dam

Boring No.: PZ-11 FL-88-1

Page 5 of 9

DEPTH	CORE/SAMPLE NO.	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RUN	BLOWS PER FT. / CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
44						
45	S-1	1 3/8"	80%	20 21 24 37	Started sampling, 1 3/8" I.D. spoon with 140 lbs hammer dropping 30"	Brown, mf, SAND Little, cmf, GRAVEL Trace, SILT (np) SP-SM
46						
47	S-2	1 3/8"	90%	23 95 37 15	Sampled — WATER TABLE @ 47'	Similar Soil
48						
49	S-3	1 3/8"	90%	11 25 19 12	Sampled Augered to 52'	Similar Soil
50						
51	S-4	1 3/8"	100%	15 23 42 57	Sampled	Similar Soil
52						
53	S-5	1 3/8"	120%	13 35 67 70	Sampled Augered to 56'	Lt. Grey, mf, SAND Trace, SILT (np) Trace, mf, GRAVEL SP-SM
54						
55	S-6	1 3/8"	80%	11 20 21 20	Sampled	Similar Soil
56						
57	S-7	1 3/8"	90%	14 13 12 22	Sampled Augered to 59'	Similar Soil Sample very wet
58						
59	S-8	1 3/8"	100%	24 29 40 39	Sampled	Similar Soil
60						

FORM 58A (Test)

Boring No. FD-88-1

Site: Birch Hill Dam

Boring No.: PZ-11 FD-88-1

DEPTH	CORE/SAMPLE NO.	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RUN	CORE/SAMPLE CORE RECVY	BLOWS PER FT.	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
60					4	Sampled	Similar Soil
					4	Augered to 64'	
61	S-9	1 3/8"	90%		8		
					8		
62					3	Sampled	Similar Soil
					8		
63	S-10	1 3/8"	78%		12		
					13		
64						Bottom of hole.	

10/18/88 - Drilling, sampling, and running 6" casing completed.

10/19/88 - Set upper piezometer at 51' and lower piezometer at 63'.

11/20/88 - Curb box was cemented into place.

PIEZOMETER INSTALLATION REPORT

PROJECT: Ford [illegible] Dam | DATE: 11/14/88

LOCATION (STA): P2 11 STA 7+00 | OFFSET FROM CENTER LINE: on ℄ | PIEZ NO.: P7

PIEZ TYPE: Casagrande | DEPTH OF PIEZ: Upper 51' Lower 63' | RISER PIPE DIAM: 3/4"

PIEZ TIP SET IN (SOIL TYPE): Upper SP-SM Lower SP-SM | SOIL SAMPLE NO.: S-4 S-10 | BORING DIAM: 6"

METHOD OF INSTALLATION:

TYPE OF PROTECTION FOR PIEZ: Curb box in Roadway | VENT:

GROUND ELEV.: 864.26 | ELEV. TOP OF RISER: Upper 863.76 Lower 864.01 | ELEV PIEZ TIP: 813.3 801.3

FILTER: #4 Sand | FROM ELEV: Upper 812.3 Lower 800.3 | TO ELEV: 818.3 808.3

SEAL: Bentonite Pellets | FROM ELEV: Upper 852.3 Lower 808.3 | TO ELEV: 856.3 812.3

INSTALLED BY: Hawkins + McAloon | CONTRACT NO.: C008 | FOREMAN: Paul Davis

DATE OF INSTALLATION: 10/19/88 | DATE OF OBSERVATIONS: 11/14/88

METHOD OF TESTING PIEZ.: Falling Head Test

TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
	Upper Piezometer 0	* 0		Lower Piezometer 0	** 0			
	1	45'		1	46'			
	2	45 1/2'		2	46 1/2			
	5	45 1/2		4	47'			
	Lower Piezometer 10	47'		Upper Piezometer 10	47'			

REMARKS:

* Water at 47' Prior To Testing

** Water at 47' Prior To Testing

Christopher H. Lauer
INSPECTOR

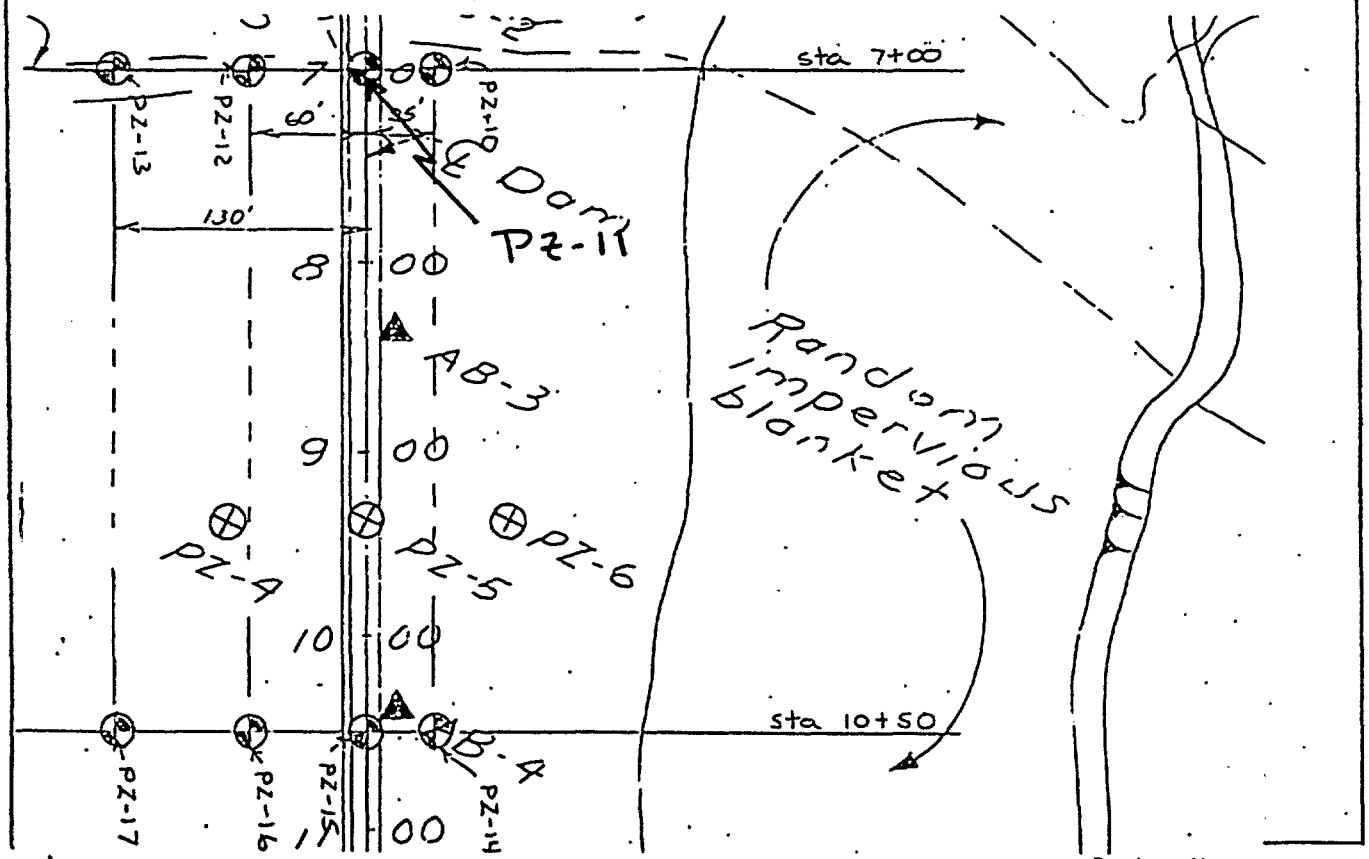
Site: Birch Hill Dam
Boring No: PZ-11

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
				Upper Lower	Upper Lower	Set 3/13/33
10/21	1:00		64	12' 10'	852 854	
11/5			64	17 47 1/3	847 816 2/3	
11/12	1:30		64	45' 46 1/2	819 817 1/2	
11/14			64	47' 47'	817 817	Falling Head Test
11/16			64	46 47	818 817	
11/17			64	46 45	818 818	
11/19			64	47' 46 1/2	817 818 1/2	
11/21			64	47 46	817 818	
12/15	Noon			47.0 47.5	817.3 816.5	STATIC

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



FORM 59(Test)
ER 71

Boring No.

ATLANTIC TESTING LABORATORIES, LIMITED

PIEZOMETER INSTALLATION DETAIL

PROJECT Birch Hill Dam, Ma.

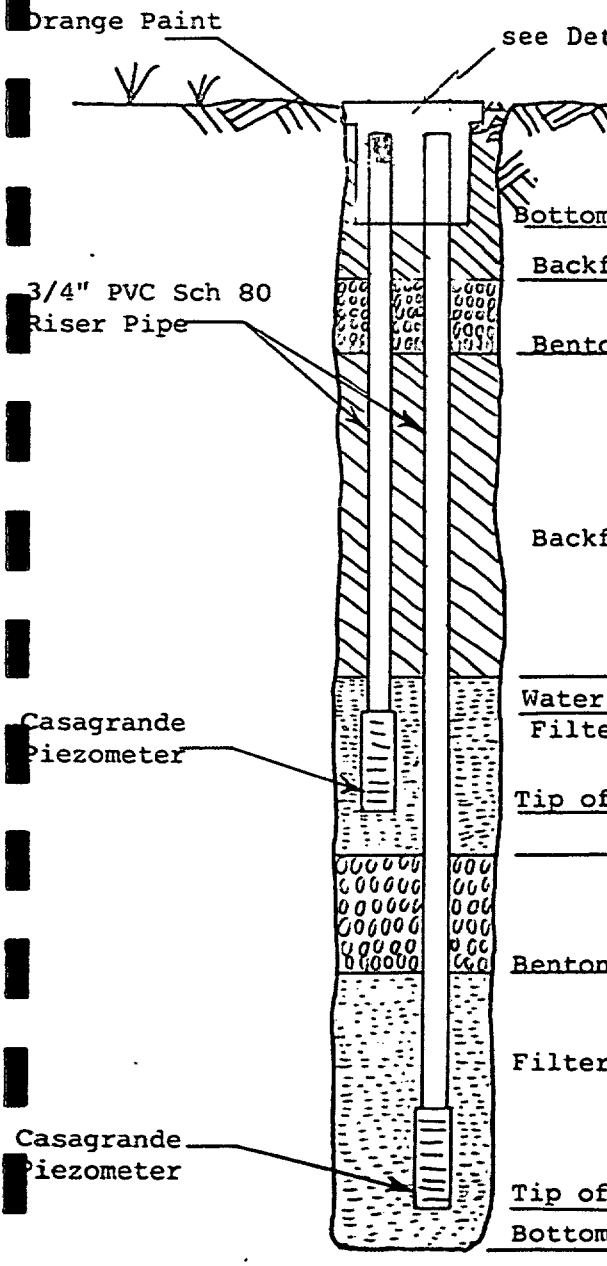
CLIENT U.S. Army Corps of Engineers
Waltham, Massachusetts

CONTRACT No. DACW-33-87-D-0007

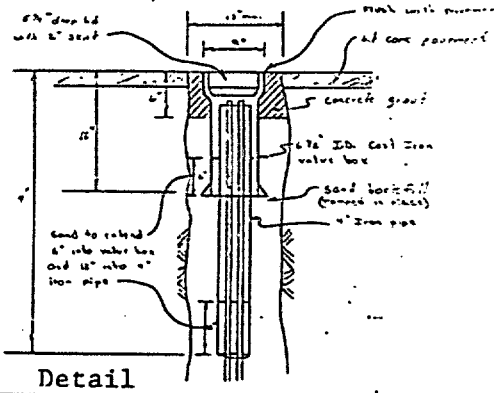
ATL PROJECT No. CD033

PIEZOMETER No. PZ-11

TOP Flush Valve Box 864.26
TOP LOWER PIEZOMETER RISER 864.01
TOP UPPER PIEZOMETER 863.96



		DEPTH	SOIL STRATA
SURFACE ELEVATION	864.3'		
			No samples as per instructions.
Bottom of Valve Box	860.3	4'	
Backfill	856.3'	8'	
Bentonite Seal	852.3'	12'	
Backfill		44'	
	818.3'	46'	Brown mf SAND, little cmf GRAVEL, trace SILT (non-plastic) SP - SM
Water Table ▽	817.3'	47'	
Filter Sand (1)			
Tip of Piezometer	813.3'	51'	
	812.3'	52'	
			Light grey mf SAND, trace SILT, trace mf GRAVEL (non-plastic) SP - SM
Bentonite Seal	808.3'	56'	
Filter Sand			
Tip of Piezometer	801.3'	63'	
Bottom	800.3'	64'	



Detail

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. CD-033

Site Birch Hill Dam — Page 1 of 8 Pages

Hole No. P2 10 / FL-88-2 — Diam. (Casing) 6" SW — Boring Started 10/13/88

Co-ordinates: N 594919 E 432181 — Boring Completed 10/19/88

Drilled by Burnham + Hart — Report Submitted 12/21/88

Purpose of Exploration Piezometer Installation

Elevation Top of Hole 655 M.S.L. — Casing Left In Place 4" DIA - 10 Feet

Total Overburden Drilled 56 Feet

Elevation Top of Rock ____ M.S.L.

Elevation Bottom of Hole 799 M.S.L.

Total Rock Drilled ____ Feet

Total Depth of Hole 144 Feet

Core Recovered ____ %

Core Recovered ____ Ft.; ____ Diam. ____ In.

Soil Samples 1 1/2 I.D. In. Diam. 10 No.

Soil Samples ____ In. Diam. ____ No. — Water Table Depth 37'

Depth From	Depth To	Method of Drilling and Type of Bit Used
0	56	Spun 6" S(x) flush coupled casing
0	35	No samples as per instructions
35	55	Continuous Sampling
44	46	Piezometer (orange)
53	55	Piezometer (grey)

INDEX

Ground Water ____ Back of Page 7
Boring Location Sketch ____ Back of Page 7
Overburden Record pages 2-5 Page ____
Rock Drilling ____ Page ____
Piezometer Installation Report Page 6
" " Detail Page 5
____ Page ____

Prepared by Christopher H. Lawrence
Field Data — Lab. Data

Submitted by Atlantic Testing Laboratories

NED FORM DEC 63 121

REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site Birch Hill Dam — Page 2 of 8 Pages

Boring No. P2-10 Desig. _____ Diam. (Casing) 6"

Co-ordinates: N 594918 E 432161

Elevation Top of Boring 855' M.S.L.
Total Overburden Drilled 56' Feet
Elevation Top of Rock _____ M.S.L.
Total Rock Drilled _____ Feet
Elevation Bottom of Boring 799' M.S.L.
Total Depth of Boring 56' Feet
Core Recovered _____ % No. Boxes _____
Core Recovered _____ Ft : _____ Diam. ____ In.
Soil Samples 1 3/8 I.D. In. Diam. 10 No.
Soil Samples _____ In. Diam. ____ No.

Hammer Wt. 140 Boring Started 10/12/55
Hammer Drop 30" Boring Completed 10/19/55
Casing Left 10'
[Subsurface Water Data] _____ Page 7
Obs. Well Piez
Drilled By Burnham + Hart
Mfg. Des. Drill _____
Inspected By: Christopher H. Lawrence
Classification By: Christopher H. Lawrence
Classification By: _____

DEPTH	CORE/SAMPLE NO.	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RANGE	BLOWS PER FT. CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
0					Spun SCW flush coupled 6" casing to 56'.	
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

GENERAL REMARKS:

Site	Boring No.	Page 3 of 8
Birch Hill Dam	PZ-10 FD-88-2	

DEPTH	CORE/SAMPLE			BLOWS PER FT.	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
	NO.	SIZE	DEPTH RUN	CORE REC'VY		
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						

Site: Birch Hill Dam

Boring No.: PZ-10 FD-88-2

DEPTH	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. / CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
28						
29						
30						
31						
32						
33						
34						
35					Sampled with 1 3/8" I.D. spoon with 140lbs hammer	
36	S-1	1 3/8"	90%	12 29 23 31		Lt. Gray, mf, SAND; Trace, cmf, ROCK FRAG.; Trace, SILT, (np) SP-SM
37					Water Table = 37'	
38	S-2	1 3/8"	80%	23 28 24 15	Sample Spun 6" casing to 39' and washed to 39' with th 5 7/8" roller bit and water	Lt. Brn, mf, SAND; Little, f, GRAVEL; Trace, SILT (np) SP-SM
39						
40	S-3	1 3/8"	90%	27 35 36 20	Sample	Lt Brn, mf, SAND; Little, f, GRAVEL, Trace, SILT (np) SP-SM
41						
42	S-4	1 3/8"	60%	31 20 24 51	Sample Spun 6" casing to 43' and washed to 43' with 5 7/8" roller bit and water	Similar Soils SP-SM
43						
44	S-5	1 3/8"	70%	42 109 85 62	Sample	Brown, c-mf, SAND Trace, m, GRAVEL SP-SM
45						

Site	Boring No.	Page 5 of 8
Birch Hill Dam	PZ-10 FD-88-2	

DEPTH	CORE/SAMPLE NO.	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RUN OR	BLOWS PER FT. CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
45				19	Sample	Similar Soil
46	S-6	1 3/8"	70%	52		SP-SM
				72		
47				60		
				13	Sample	Brown, c-mf, SAND
48	S-7	1 3/8"	70%	18	Spun 6" casing to 47' and washed to 47' with 5 7/8" roller bit and water	Lt. Grey, SILT
				21		Trace, f, SAND
49				23		Trace, CLAY (Very Slightly Plastic) ML
				20	Sample	Lt, Grey, SILT
50	S-8	1 3/8"	60%	30		Trace, f, SAND
				28		Trace, CLAY
51				32		ML
				47	Sample	Similar Soil
52	S-9	1 3/8"	70%	22	Spun casing to 51' and washed hole to 51' with 5 7/8" roller bit and water	
				21		
53				18		
				39	Sample	Similar Soil
54	S-10	1 3/8"	60%	57		
				41		
55				16		
56					Hole was washed to a depth of 56' with 5 7/8" roller bit and water. Drilling Ended 10/19/88	
					10/13/88 - Completed drilling and sampling	
					10/19/88 Set upper piezometer at 46' (orange) Lower piezometer 55' (grey)	

PIEZOMETER INSTALLATION REPORT

PROJECT: [illegible] H. [illegible] DATE: [illegible]/9/85

LOCATION (STA): P?-1? STA. 7+00 OFFSET FROM CENTER LINE: 35' RT. PIEZ NO.: P[illegible]

PIEZ TYPE: Casagrande DEPTH OF PIEZ: Upper 46' Lower 55' RISER PIPE DIAM: 3/4"

PIEZ TIP SET IN (SOIL TYPE): SP-SM ML SOIL SAMPLE NO.: S-6 S-10 BORING DIAM: 6"

METHOD OF INSTALLATION:

TYPE OF PROTECTION FOR PIEZ: 4" PROTECTIVE PIPE VENT: Screw on Cap

GROUND ELEV.: 854.9 ELEV. TOP OF RISER: Upper 858.0 Lower 858.1 ELEV PIEZ TIP: 810.9 799.9

FILTER: #4 Sand FROM ELEV: Upper 805.9 Lower 798.9 TO ELEV: 846.9 803.9

SEAL: Bentonite Pellets FROM ELEV: Upper 846.9 Lower 803.9 TO ELEV: 850.9 805.9

INSTALLED BY: Burnham + Hart CONTRACT NO.: CC08 FOREMAN: Paul Davi[illegible]

DATE OF INSTALLATION: 10/17/[illegible] DATE OF OBSERVATIONS: 11/9/[illegible]

METHOD OF TESTING PIEZ.: Falling Head Test

TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
	Lower Piezometer 0	* 0		Upper Piezometer 0	** 0			
	1	31		1	29			
	2	33		2	34			
	4	39		4	39			
	10	39		10	39 1/3			

REMARKS:

* WATER AT 39' PRIOR TO TESTING

** WATER AT 39 1/3' PRIOR TO TESTING

Christopher H. Lawre[illegible]
INSPECTOR

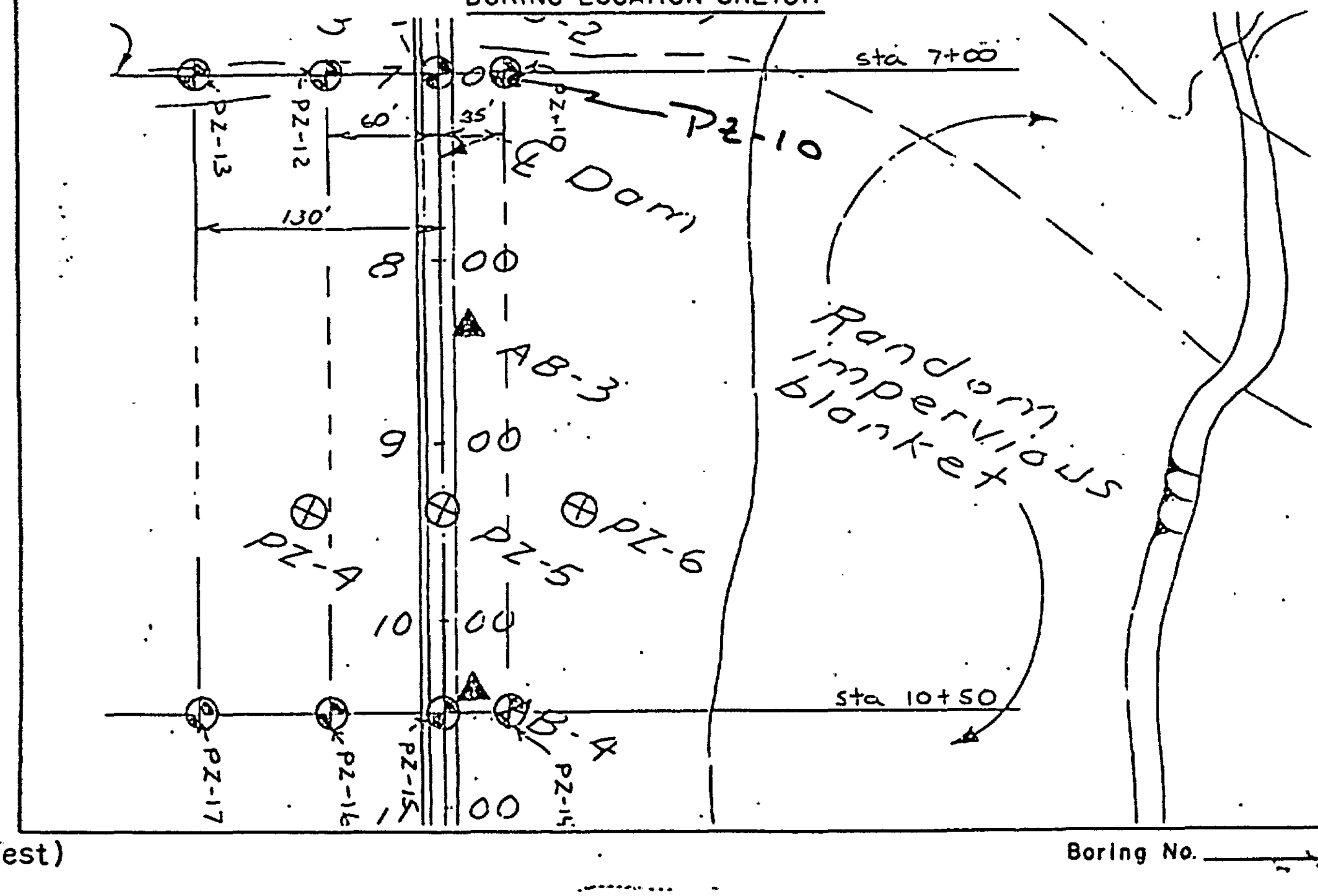
Site: Birch [illegible] Dam
Boring No: PZ-10

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER		ELEVATION WATER		REMARKS
				Upper	Lower	Upper	Lower	
10/21			56	37'10"	40	817'2"	815	
11/9			56	39 1/3	39	815 2/3	816	Falling Head Tests.
11/[illegible]	1:00		56	41	41	814	814	
11/[illegible]			[illegible]	42	40 1/2	813	814 1/2	
[illegible]			56	40	40	815	[illegible]	
11/15			56	39	40	816	815	
11/[illegible]			56	38	39	817	816	
11/1[illegible]			56	39	40	816	815	
[illegible]			56	39	39	816	816	
12/15	1PM			40.2	40.5	817.8	817.6	STATIC

Note: Depths are in feet below original ground.

BORING LOCATION SKETCH



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PIEZOMETER INSTALLATION DETAIL

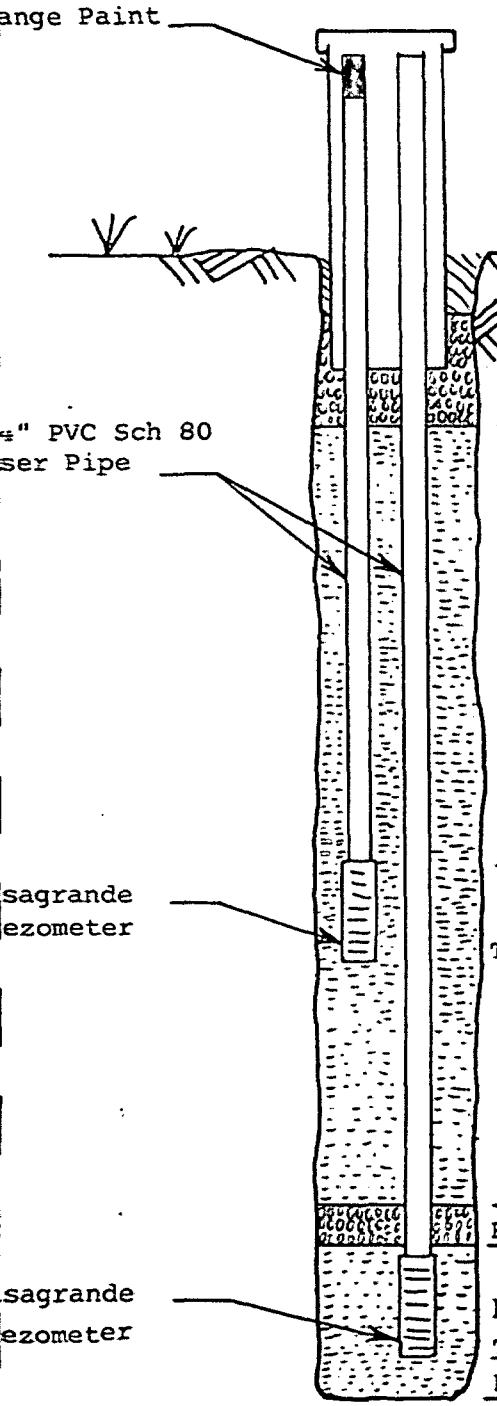
PROJECT Birch Hill Dam, Ma.

CONTRACT No. DACW-33-87-D-0007

ATL PROJECT No. CD033

CLIENT U.S. Army Corps of Engineers
Waltham, Massachusetts

PIEZOMETER No. PZ-10



TOP PROTECTIVE PIPE 858.11
TOP LOWER PIEZOMETER RISER 858.07
TOP UPPER PIEZOMETER 857.99

		DEPTH	SOIL STRATA
SURFACE ELEVATION	854.9'		
Surface Gravel	850.9'	4'	No samples as per instructions.
Bottom of Pipe	848.1'	7'	
Bentonite Seal	846.1'	9'	
		35'	
Filter Sand Water Table	▽817.6'	37.3'	Light grey brown mf SAND, little GRAVEL and ROCK FRAGMENTS, trace SILT (non-plastic) SP - SM
Tip of Piezometer	810.9'	44'	
		43'	
		47'	Brown cmf SAND, trace m GRAVEL (non-plastic) SP - SM
	805.9'	49'	Brown c-mf SAND, light grey SILT, trace SAND, trace CLAY (very slightly plastic) ML
Bentonite Seal	803.9'	51'	Light grey SILT, trace f SAND, trace clay (very slightly plastic) ML
Filter Sand Tip of Piezometer	799.9'	55'	
Bottom	798.9'	56'	

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. CO-033

Site Birch Hill Dam — Page 1 of 9 Pages

Hole No. PZ-15 (FD-88-3) Diam. (Casing) 6" SW — Boring Started 10/19/88

Co-ordinates: N 594574 E 432106 — Boring Completed 10/20/88

Drilled by Hawkins + McAlear — Report Submitted 12/21/88

Purpose of Exploration Install 2 piezometers

Elevation Top of Hole 864 M.S.L.
Total Overburden Drilled 65 Feet
Elevation Top of Rock ____ M.S.L.
Elevation Bottom of Hole 799 M.S.L.
Total Rock Drilled ____ Feet
Total Depth of Hole 65' Feet
Core Recovered ____ %
Core Recovered ____ Ft.; ____ Diam. ____ In.
Soil Samples 1 3/8" I.D. In. Diam. 12 No.
Soil Samples ____ In. Diam. ____ No.

Casing Left in Place Flush Mounted Cover Box Feet

Water Table Depth 51'

Depth From	Depth To	Method of Drilling and Type of Bit Used
0	65	Entire hole drilled with 6" SW Casing
0	40	No sampler as per instructions
40	64	Continuous sampling
45	47	Upper Piezometer (Orange)
62	64	Lower Piezometer (grey)

INDEX

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Boring Location Sketch ____ Back of Page 8
Overburden Record pages 2 - 6 Page ____
Rock Drilling ____ Page ____
Piezometer Installation Report Page 7
" " Detail Page 9
____ Page ____

Prepared by Christopher H. Lawrence
Field Data — Lab. Data

Submitted by Atlantic Testing Laboratories

NED FORM DEC 63 121 REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site Birch Hill Dam — Page 2 of 9 Pages

Boring No. P2-15 (FD-88-3) Desig. ____ Diam. (Casing) 6"

Co-ordinates: N 594574 E 432106

Elevation Top of Boring 864' M.S.L.
Total Overburden Drilled 65 Feet
Elevation Top of Rock ____ M.S.L.
Total Rock Drilled ____ Feet
Elevation Bottom of Boring 799 M.S.L.
Total Depth of Boring 65' Feet
Core Recovered ____ % No. Boxes ____
Core Recovered ____ Ft : ____ Diam. ____ In.
Soil Samples 1 3/8" In. Diam. 12 No.
Soil Samples ____ In. Diam. ____ No.

Hammer Wt. 140
Hammer Drop 30"
Casing Left ____
Subsurface Water Data ____ Page 8
Obs. Well ____
Drilled By Hawkins + McAleer
Mfg. Des. Drill ____
Inspected By: Christopher H. Lawrence
Classification By: Christopher H. Lawrence
Classification By: ____

Boring Started 10/19/82
Boring Completed 10/20/82

DEPTH	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
0					Entire hole drilled with 4 1/4" auger with the 6" SW flush coupled casing advanced with 300 lbs hammer to 62 1/2 feet.	No samples taken to a depth of 40' as per instructions.
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

GENERAL REMARKS:

Site	Boring No.	Page 2 of 9
Birch Hill Dam	PZ-15 FD-88-3	

DEPTH		CORE/SAMPLE			BLOWS PER FT. CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
	FT.	NO.	SIZE	DEPTH RANGE			
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							

Site: Birch Hill Dam

Boring No.: PZ-15 FD-88-3

DEPTH	CORE/SAMPLE NO.	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RUN	BLOWS PER FT. / CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41	S-1	1 3/4"	70%	39 48 37 25	Sampled with 1 3/8" I.D. spoon advanced with the 140 lbs hammer.	Brown, mf, SAND Trace, SILT. Trace, ROCK FRAGMENTS (NP) Dry SP-SM
42						
43	S-2	1 3/8"	90%	15 37 49 50	Sample	Similar Soil Little, mf, GRAVEL SP-SM (NP) Dry
44						

Site: Burnt Hill Dam | Boring No.: PZ-15 FD-88-3 | Page 5 of 9

DEPTH	CORE/SAMPLE NO.	SIZE	DEPTH RUN	BLOWS PER FT. / CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
44				32	Sample - Augered down to 42'	Same Soil
45	S-3	1 3/8"	90%	75 37 34		Dry SP-SM
46				27	Sample	Brown + Dark Grey, mf, SAND Trace, GRAVEL, Trace Silt (np) Dry. SP-SM
47	S-4	1 3/8"	100%	38 78 53		
48				49	Sample Augered down to 52'.	Same Soil Little, GRAVEL (np) Dry SP-SM
49	S-5	1 3/8"	100%	57 45 49		
50				13	Sampled	Lt Gray + Brown, mf, SAND, Trace, SILT (np) Wet SP-SM
51	S-6	1 3/8"	90%	18 17	Water Table	
52				18		
53	S-7	1 3/8"	90%	15 17 15	Sampled Augered to 56'	Lt. Brown, mf, SAND Trace, SILT (np) Wet SP-SM
54				15		
55	S-8	1 3/8"	100%	3 5 5	Sample	Lt. Gray, f, SAND Little, SILT (np) Wet SP-SM
56				6		
57	S-9	1 3/8"	100%	7 8 6	Sample Augered to 60'	Lt Grey, SILT, some, SAND Lt Grey, some, CLAY (USP) Wet SP-SC
58				6		
59	S-10	1 3/8"	100%	4 3 6	Sample	Similar Soil (USP) Wet SP-SC
60				15		
61	S-11	1 3/8"	90%	6 8	Sample Augered to 64'	Similar Soil (USP) Wet SP-SC

58A(Test)

Boring No. FD-88-3

Site: Birch Hill Dam

Boring No.: PZ-15-FD-88-3

Page 6 of 9

DEPTH	CORE/SAMPLE NO.	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RUN	CORE/SAMPLE CORE REC'VY	BLOWS PER FT.	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
61	S-11				7 7		
62	S-12	3"	90%		6 8 10 11	Sample Advanced 6" SW casing with 300 lbs hammer to a depth of 62 1/2'.	Similar Soil (USP) Wet SP-SC
63							
64						Augered to 65'	
65						10/19/88 - Completed drilling sampling, and running casing. 10/20/88 - set upper piezometer at 47 (gauge) Lower piezometer at 54. Curb box put in.	

PIEZOMETER INSTALLATION REPORT

PROJECT: Bird H.H. Dam | DATE: 11/14/88

LOCATION (STA): PZ-1E Sta 10+50 | OFFSET FROM CENTER LINE: on ℄ | PIEZ NO.: PZ-1E

PIEZ TYPE: Casagrande | DEPTH OF PIEZ: Upper 45-47, Lower 62-64 | RISER PIPE DIAM: 3/4"

PIEZ TIP SET IN (SOIL TYPE): Upper SP-SM, Lower SP-SC | SOIL SAMPLE NO.: S-3 + S-4, S-12 | BORING DIAM: 6"

METHOD OF INSTALLATION:

TYPE OF PROTECTION FOR PIEZ: Curb Box in Roadway | VENT: Screw on Cap

GROUND ELEV.: 864.5 | ELEV. TOP OF RISER: Upper 864.33, Lower 864.33 | ELEV PIEZ TIP: Upper 817.5, Lower 800.5

FILTER: #4 Sand | FROM ELEV: Upper 816.5, Lower 799.5 | TO ELEV: 825.0, 812.5

SEAL: Bentonite Pellets | FROM ELEV: Upper 858.5, Lower 812.5 | TO ELEV: 862.5, 816.5

INSTALLED BY: Hawkins and McAloon | CONTRACT NO.: 0008 | FOREMAN: Paul Davis

DATE OF INSTALLATION: 10/20/88 | DATE OF OBSERVATIONS: 11/14/88

METHOD OF TESTING PIEZ.: Falling Head (Field)

TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
	Riser Pipe 0	* 0'		0	Piezometer 0'		Upper Piezometer 15	34 1/2
	1	46'		1	32'		30	35 1/2
	2	47'		2	23'			
	Lower 3	48'		4	Upper 22'			
	10	45'		10	22 3/4			

REMARKS:

* Water at 48' Prior To Testing

** Water at 36' Prior To Testing

Christopher H. Lawrence
INSPECTOR

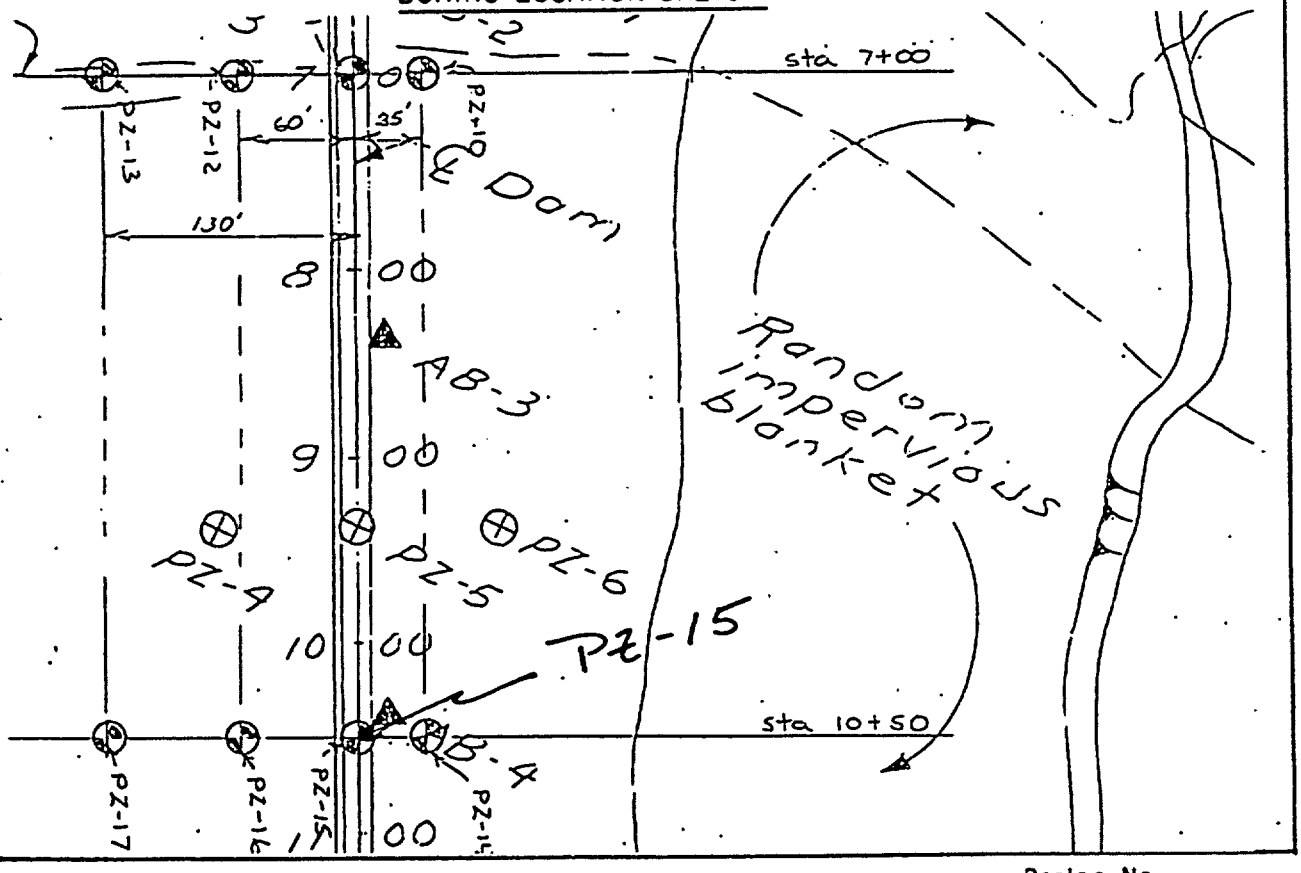
Site: [illegible] Dam
Boring No: PZ-15

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
				Upper Lower	Upper Lower	
11/9				16 12	842 845	
11/10	8 am			35 1/2 32 1/2	825 2/3 810 1/3	
11/14	10 am			36 48	826 812	Falling Head Test
11/15	- - -			37 32 1/2	825 812 1/2	
11/16	9 am			38 52	824 792	
11/19	10 am			37 52	825 792	
11/21	8 am			36 51	826 793	
12/5	noon			37 6 46 7	826.7 817.9	STATIC

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



Boring No. [illegible]

ATLANTIC TESTING LABORATORIES, LIMITED

PIEZOMETER INSTALLATION DETAIL

PROJECT Birch Hill Dam, Ma.

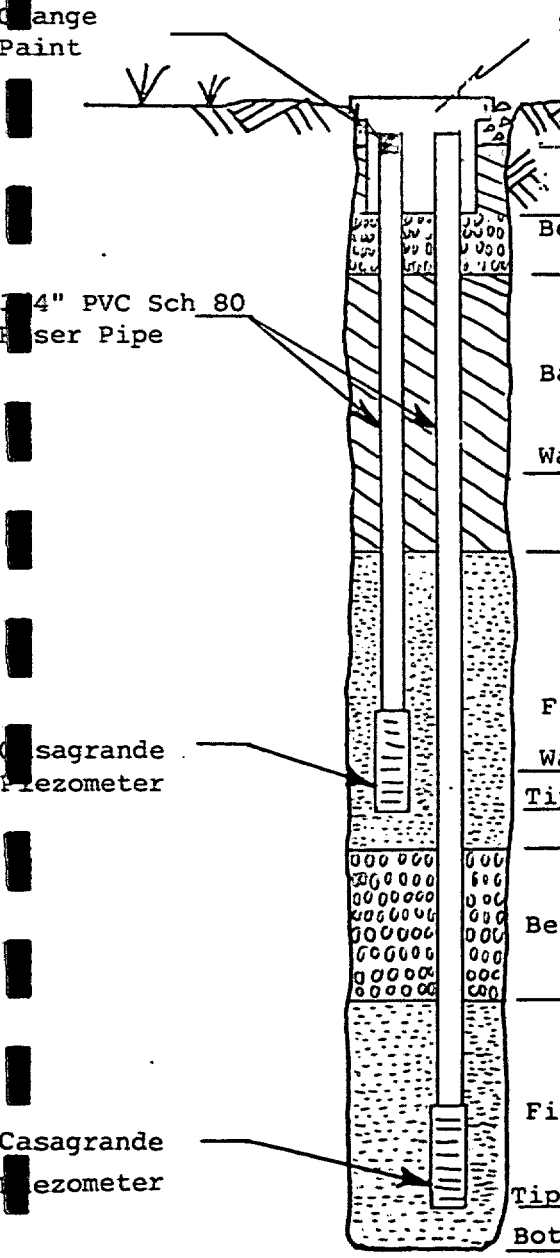
CONTRACT No. DACW-33-87-D-0007

ATL PROJECT No. CD033

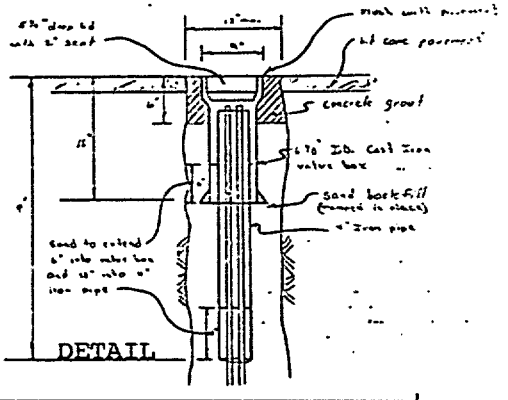
CLIENT U.S. Army Corps of Engineers
Waltham, Massachusetts

PIEZOMETER No. PZ-15

TOP Flush Valve Box 864.48
TOP LOWER PIEZOMETER RISER 864.33
TOP UPPER PIEZOMETER 864.33



		DEPTH	SOIL STRATA
SURFACE ELEVATION	864.5'		
Concrete	864.0'	0.5'	No samples above 40' as per instructions.
Sand	860.5	4.0'	
Bentonite Seal	858.5'	6'	
Backfill			
Water Table	▽826.7'	37.6'	
	825.0'	39.5'	
		40'	Brown and grey mf SAND, trace GRAVEL, trace SILT (non-plastic) SP - SM
Filter Sand			
Water Table	▽817.9'	46.4'	
Tip of Piezometer	817.5'	47'	
	816.5'	48'	
		50'	
Bentonite Seal			Light grey f SAND, little SILT (non-plastic) SP - SM
	812.5'	52'	
		56'	
Filter Sand			Light grey SILT, some SAND, light grey, some CLAY (very slightly plastic) SP-SC
Tip of Piezometer	800.5'	64'	
Bottom	799.5'	65'	



CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. CD-033

Site Birch Hill Dam — Page 1 of 8 Pages

Hole No. PZ-14 (FD-88-4) Diam. (Casing) 6" SW — Boring Started 10/20/88

Co-ordinates: N 594572 E 432148 — Boring Completed 10/21/88

Drilled by Burham & Hart — Report Submitted 12/21/88

Purpose of Exploration Install 2 piezometers

Elevation Top of Hole 854 M.S.L. — Casing Left in Place 4' DIA. - 10' Feet

Total Overburden Drilled 56 Feet

Elevation Top of Rock ____ M.S.L.

Elevation Bottom of Hole 798 M.S.L.

Total Rock Drilled ____ Feet

Total Depth of Hole 56 Feet

Core Recovered ____ %

Core Recovered ____ Ft.; ____ Diam. ____ In.

Soil Samples 1 3/8" I.D. In. Diam. 13 No.

Soil Samples ____ In. Diam. ____ No. — Water Table Depth 36'

Depth From	Depth To	Method of Drilling and Type of Bit Used
0	56	Spun 6" Flush coupled casing
0	29	No samples as per instructions
29	56	Continuous samples
40	42	(Upper Piezometer (orange)
53	55	Lower Piezometer (grey)

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Overburden Record pages 2-5 Page ____
Rock Drilling ____ Page ____
Piezometer Installation Report Page 6
" " Detail Page 5
____ Page ____

Prepared by Christopher H. Lawrence
Field Data — Lab Data

Submitted by Atlantic Testing Laboratories

NED FORM DEC 63 121 — REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site Birch Hill Dam Page 1 of 8 Pages

Boring No. P2-1C / ED-88-4 Desig. _____ Diam. (Casing) 6"

Co-ordinates: N 594572 E 432148

Elevation Top of Boring 854 M.S.L. Hammer Wt. 140 lbs Boring Started 10/20/88

Total Overburden Drilled 56 Feet Hammer Drop 30" Boring Completed 10/21/88

Elevation Top of Rock _____ M.S.L. Casing Left 10'

Total Rock Drilled _____ Feet Subsurface Water Data Page 7

Elevation Bottom of Boring 798 M.S.L. Obs. Well _____

Total Depth of Boring 56 Feet Drilled By Burnham + Hart

Core Recovered _____ % No. Boxes _____ Mfg. Des. Drill _____

Core Recovered _____ Ft. _____ Diam. _____ In. Inspected By: Christopher H. Lawrence

Soil Samples 1 3/8" I.D. In. Diam. 11 No. Classification By: Christopher H. Lawrence

Soil Samples 2 3/8" I.D. In. Diam. 2 No. Classification By: _____

DEPTH	CORE/SAMPLE NO.	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RANGE	BLOWS PER FT. CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
0					Spun 6" SW flush coupled casing to the bottom depth of 56'.	No samples above 29' as per instructions.
1					About 2 hours to clear rocks so that drilling could begin.	
2					5 truck loads of gravel was used to make the drilling platform.	
3						
4						
5						
6						
7						
8						
9						
10						

GENERAL REMARKS:

Site: Birch Hill Dam

Boring No.: PZ-14 FD-88-4

DEPTH		CORE/SAMPLE			BLOWS PER FT. CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
	1'=	NO.	SIZE	DEPTH RANGE			
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							

Site: Birch Hill Dam

Boring No.: PZ-14 FD-88-4

Page 4 of 8

DEPTH	CORE/SAMPLE NO.	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RUN	BLOWS PER FT. / CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
27						
28						
					End Drilling 10/20/88	
29				12	Sampled with 1 3/8" I.D. spoon. Spun casing to 33'. Water and drilling fluid was used to lubricate the casing.	Dark Grey, f, SAND Little, Silt Trace, f, GRAVEL SP-SM
30	S-1	1 3/8"	60%	24		
				40		
				73		
31				41	Sampled	Grey, f, SAND Trace, SILT Trace, f, GRAVEL SP-SM
32	S-2	1 3/8"	70%	13		
				18		
				9		
33				12	Sampled Spun casing to 37'.	Grey, f, SAND Trace, SILT Trace, GRAVEL SP-SM
34	S-3	1 3/8	60%	24		
				50		
				88		
35				18	Sampled	Similar Soil Large Rock Fragments SP-SM
36	S-4	1 3/8"	10%	Bouncing	WATER TABLE @ 36'	
37				20	Sampled Spun casing to 41'.	Brown, mf, SAND Trace, SILT Trace, f, Gravel SP-SM
38	S-5	1 3/8"	70%	28		
				32		
				34		
39				34	Sampled	Brown, mf, SAND Some, SILT Trace - ROCK FRAGMENTS SP-SM
40	S-6	1 3/8"	80%	48		
				49		
				43		
41				23	Sampled Piece of coarse gravel wedged in shoe. Spun casing to 45'.	Lt. Gray, SILT, some f SAND SP-SM
42	S-7	1 3/8"	20%	37		
				47		
				34		
43				46	Sampled 1 3/8" spoon got blocked so the 2 3/8" spoon was used.	Grey, mf, SAND Trace, ROCK FRAGMENTS SP-SM
44	S-8	2 3/8	50%	45		

Site	Boring No.	Page
Bi... Hi... Dam	PE-14 FD-88-4	5 of 8

DEPTH		CORE/SAMPLE NO.	SIZE	DEPTH RUN	BLOWS PER FT. CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
44		S-8			50 / 45		
45		S-9	1 3/8"	80%	28 / 24 / 20 / 30	Sampled with 1 3/8" I.D. spoon. Spun casing to 49'.	Lt. Grey, SILT, some, F. SAND ML
47		S-10	1 3/8"	90%	25 / 33 / 33 / 29	Sampled with 2 3/8" I.D. spoon because 1 3/8" I.D. spoon was bleeded with a rock	Similar Soil ML
49		S-11	1 3/8"	60%	15 / 16 / 3 / 21	Sampled with 1 3/8" I.D. spoon. Spun casing to 53'.	Similar Soil ML
51		S-12	1 3/8"	90%	45 / 48 / 50 / 60	Sampled	Similar Soil ML
53		S-13	1 3/8"	70%	6 / 8 / 16 / 24	Sampled. Spun casing to 56'.	Similar Soil ML
55						10/21/88 Set upper piezometer at 42' and lower piezometer at 55' Set steel riser pipe..	
56							

PIEZOMETER INSTALLATION REPORT

PROJECT: Birch Hill Dam | DATE: 11/19/[illegible]

LOCATION (STA): PZ-14 | Sta 10+50 | OFFSET FROM CENTER LINE: 35' Rt. | PIEZ NO.: PZ-14

PIEZ TYPE: Casagrande | DEPTH OF PIEZ: Upper 42, Lower 55 | RISER PIPE DIAM: 3/4"

PIEZ TIP SET IN (SOIL TYPE): SP-SM, ML | SOIL SAMPLE NO.: S-7, S-13 | BORING DIAM: 6"

METHOD OF INSTALLATION:

TYPE OF PROTECTION FOR PIEZ: 4" Protective Pipe | VENT: Screw on Cap

GROUND ELEV.: 854 | ELEV. TOP OF RISER: Upper 857.4', Lower 857.5' | ELEV PIEZ TIP: 812, 799

FILTER: #4 Sand | FROM ELEV: Upper 807.0', Lower 798.0' | TO ELEV: 819.0, 803.0

SEAL: Bentonite Pellets | FROM ELEV: Upper 844, Lower 803 | TO ELEV: 846, 804

INSTALLED BY: Boyd Tait | CONTRACT NO.: 0008 | FOREMAN: Paul Davis

DATE OF INSTALLATION: 10/21/[illegible] | DATE OF OBSERVATIONS: 11/19[illegible]

METHOD OF TESTING PIEZ.: Falling Head Test

TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
	Lower Piezometer 0	0'		Upper Piezometer 0	0'			
	1	30'		1	31			
	2	37		2	36			
	4	37		4	37 1/2			
	10	37		10	37 1/2			

REMARKS:

* Water at 39' Prior To Testing

** Water at 39 1/2 Prior To Testing

Christopher H. Lawrence
INSPECTOR

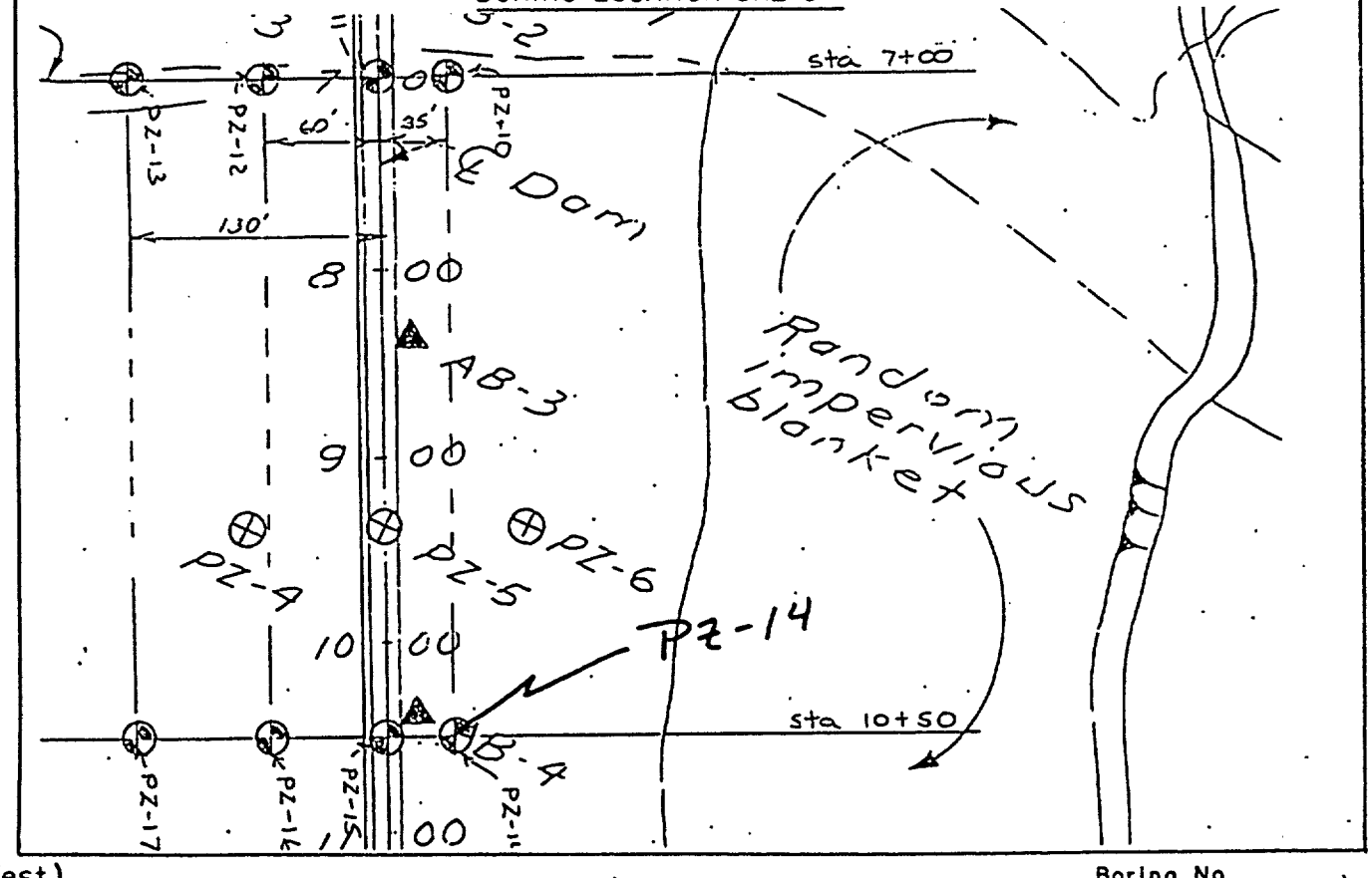
Site: Birch Hill Dam
Boring No: B-1

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER		ELEVATION WATER		REMARKS
				Upper	Lower	Upper	Lower	
10/21			56'	39 1/2	11' 1/3	848.9	845.8	
11/9			56'	39 3/4	39 1/2	817.6	818.0	
11/11	1:30		56'	39 1/2	39 1/3	817.9	818.2	
11/14			56'	39	39	818.4	818.5	
11/15			56'	39	39	818.4	818.5	
11/17			56'	39 1/2	39	818.9	819.5	
11/18			56'	39	39 1/3	818.4	818.2	Falling Head Test
11/21			56'	39 1/3	39 1/3	818.1	818.2	
12/15	12			39.4	39.3	818.1	818.1	STATIC

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



FORM 59 (Test)

Boring No. B-1

ATLANTIC TESTING LABORATORIES, LIMITED

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PIEZOMETER INSTALLATION DETAIL

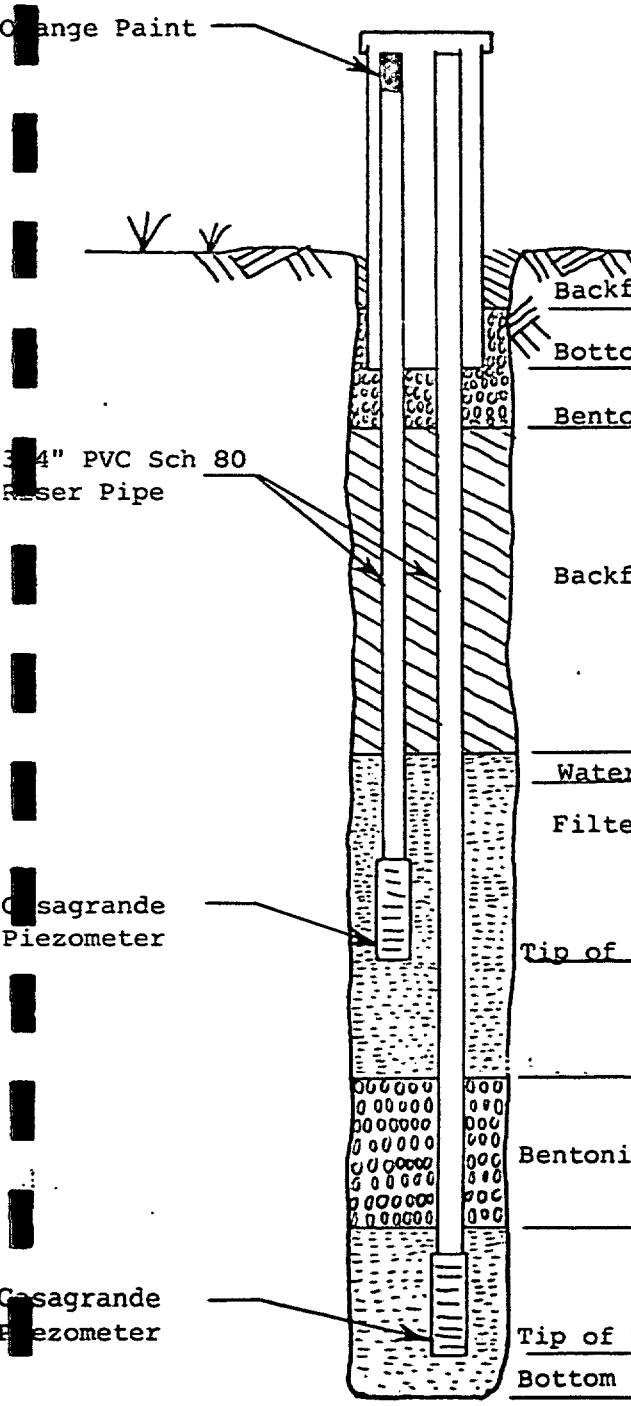
PROJECT Birch Hill Dam, Ma.

CLIENT U.S. Army Corps of Engineers
Waltham, Massachusetts

CONTRACT No. DACW-33-87-D-0007

ATL PROJECT No. CD033

PIEZOMETER No. PZ-14



TOP PROTECTIVE PIPE 857.82
TOP LOWER PIEZOMETER RISER 857.50
TOP UPPER PIEZOMETER 857.42

		DEPTH	SOIL STRATA
SURFACE ELEVATION	854.0'		
Backfill	848.0'	6'	No sample as per instructions.
Bottom of Pipe	846.0'	8'	
Bentonite Seal	844.0'	10'	
Backfill		29'	
	820.3 ~~819.0'~~	33.7 ~~34'~~	Grey f SAND, trace SILT, trace GRAVEL
Water Table ▽ 11/1	818.0'	36'	
Filter Sand		37'	
		41'	Brown mf SAND, some SILT, trace ROCK FRAGMENTS, (non-plastic) SP - SM
Tip of Piezometer	813.3 ~~812.0'~~	~~42'~~	
	807.8 ~~807.0'~~	46.8 ~~47'~~	Light grey SILT, some f SAND (very slightly plastic) ML
Bentonite Seal			
	803.8 ~~803.0'~~	50.2 ~~51'~~	
Tip of Piezometer	799.8 ~~799.0'~~	54.2 ~~55'~~	
Bottom	798.0'	56'	

per USACE Measurements
1 Feb 89
ATI

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. CD-033

Site Birch Hill Dam — Page 1 of 8 Pages

Hole No. PZ-12 (FD-88-5) Diam. (Casing) 6" SW — Boring Started 11/3/88

Co-ordinates: N 594926 E 432087 — Boring Completed 11/9/88

Drilled by Test + Price — Report Submitted 12/21/88

Purpose of Exploration: Install 2 piezometers

Elevation Top of Hole ~~947~~ 946.7 M.S.L. — Casing Left In Place 4" DIA. - 10 Feet

Total Overburden Drilled 51' Feet

Elevation Top of Rock _____ M.S.L.

Elevation Bottom of Hole ~~897~~ 895.7 M.S.L.

Total Rock Drilled _____ Feet

Total Depth of Hole 51' Feet

Core Recovered _____ %

Core Recovered _____ Ft.; _____ Diam. _____ In.

Soil Samples 1 3/8" ID In. Diam. 11 No.

Soil Samples _____ In. Diam. _____ No. — Water Table Depth 31

Depth From	Depth To	Method of Drilling and Type of Bit Used
0	30'	Rambod 6" SW flush coupled casing
0	28'	No samples as per instructions
28	50	Continous sampling
48	50	Lower piezometer (grey)
40	42	Upper piezometer (orange)
0	3'	4 x 5½" Core

INDEX

Ground Water _____ Back of Page 7
Boring Location Sketch _____ Back of Page 7
Overburden Record Pages 2-5 Page _____
Rock Drilling _____ Page _____
Piezometer Installation Report Page 6
" " Detail Page 8
_____ Page _____

Prepared by Christopher H. Lawrence
Field Data — Lab. Data

Submitted by ATLANTIC TESTING LABORATORIES

NED FORM DEC 63 121 — REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site Birch Hill Dam Page 1 of 8 Pages

Boring No. P2-12 FD-88-5 Desig. _____ Diam. (Casing) 6"

Co-ordinates: N 594926 E 432097

Elevation Top of Boring 848 M.S.L.
Total Overburden Drilled 51 Feet
Elevation Top of Rock _____ M.S.L.
Total Rock Drilled _____ Feet
Elevation Bottom of Boring 797 M.S.L.
Total Depth of Boring 51 Feet
Core Recovered _____ % No. Boxes _____
Core Recovered _____ Ft. _____ Diam. _____ In.
Soil Samples 1 3/8" In. Diam. 11 No.
Soil Samples _____ In. Diam. _____ No.

Hammer Wt. 140 lbs Boring Started 11/3/55
Hammer Drop 30" Boring Completed 11/8/55
Casing Left 10'
Subsurface Water Data _____ Page 7
Obs. Well _____
Drilled By Tait + Price
Mfg. Des. Drill _____
Inspected By: Christopher H. Lawrence
Classification By: Christopher H. Lawrence
Classification By: _____

DEPTH	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
0					Drilled with 5 7/8" roller bit and water. Then pounded the 6" casing to 25' with 300 lbs hammer. Took about 2 hours to get through the surface rocks, with 4 x 5½' Core from 0-3'.	No samples above 28' as per instructions.
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

GENERAL REMARKS:

Site	Boring No.	Page 2 of 8
Birch Hill Dam	PZ-12 FD-88-5	

DEPTH		CORE/SAMPLE			BLOWS PER FT. CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
	ft.	NO.	SIZE	DEPTH RANGE			
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25						End Drilling 11/3/88	
26							
27							

Site: Bird Hill Dam | Boring No. PZ-12 FD-88-5 | Page 4 of 8

DEPTH (ft)	CORE/SAMPLE NO.	SIZE	DEPTH RUN	BLOWS PER FT. / CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
27						
28						
29	S-1	1 3/8"	60%	15 26 37 51	Sampled with 1 3/8" I.D. spoon advanced with 140 lbs hammer Drilled to 30' and advanced casing to 30'. End Drilling 11/4/88 for weekend	Yellow Brown, cmf, SAND Little, mf, GRAVEL Trace, SILT SP-SM
30						
31	S-2	1 3/8"	90%	38 73 68 82	Sampled WATER TABLE End Drilling 11/7/88	Brown, mf, SAND Trace, SILT Trace, f, GRAVEL SP-SM
32						
33	S-3	1 3/8"	60%	50 56 62 74	Sampled	Similar Soil
34						
35	S-4	1 3/8"	20%	11 26 41 47	Sampled Drilled to 38' with 5 7/8" roller bit and water based drilling fluid to hold the hole open.	Similar Soil
36						
37	S-5	1 3/8"	50%	46 68 98 100	Sampled	Similar Soil Little, mf, GRAVEL
38						
39	S-6	1 3/8"	90%	31 21 25 39	Sampled Drilled to 42' with 5 7/8" roller bit and water based drilling fluid.	Yellow Brown, cmf, SAND Little, mf, GRAVEL; Trace SILT SP-SM
40						
41	S-7	1 3/8"	70%	28 26 27 25	Sampled	Similar Soils
42						
43	S-8	1 3/8"	30%	16 13 14 22	Sampled Drilled to 46' with 5 7/8" roller bit and water based drilling fluid.	Lt Grey, SILT, some f, SAND Little, CLAY ML (USP)
44						

58A(Test)

Boring No. FD-88-5

Site: Birch Hill Dam

Boring No.: PZ-12 FD-88-5

Page 5 of 8

DEPTH	CORE/SAMPLE NO.	SIZE	DEPTH RUN	BLOWS PER FT. / CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
44				8	Sampled	Similar Soil
45	S-9	1 3/8"	90%	11 14 16		
46				12	Sampled Drilled to 51' with 5 7/8" roller bit and water based drilling fluid.	Similar Soil
47	S-10	1 3/8"	90%	11 15 13		
48				8	Sampled	Similar Soil
49	S-11	1 3/8"	90%	7 8 9		
50					Drilled to 51' with 5 7/8" roller bit and water based drilling fluid. Drove SW to 30'.	
51					11/8/88 - Completed drilling, sampling, and set upper piezometer at 42' (orange) and lower piezometer at 50' (grey).	
					Hole was drilled an extra 3 feet on Terry Wong's recommendation to make enough room for both piezometers in their proper sand/gravel layers	

FORM 58A (Test)

Boring No. FD-88-5

PIEZOMETER INSTALLATION REPORT

PROJECT: Birch Hill Dam | DATE: 11/9/[illegible]

LOCATION (STA): PZ 12 sta 7+00 | OFFSET FROM CENTER LINE: 60' Left | PIEZ NO.: PZ-12

PIEZ TYPE: Casagrande | DEPTH OF PIEZ: Upper 40-42, Lower 48-50 | RISER PIPE DIAM: 3/4"

PIEZ TIP SET IN (SOIL TYPE): SP-SM, ML | SOIL SAMPLE NO.: S-7, S-11 | BORING DIAM: 6"

METHOD OF INSTALLATION:

TYPE OF PROTECTION FOR PIEZ: 4" Protective Pipe | VENT: Screw on Cap

GROUND ELEV.: ~~848~~ 846.7 | ELEV. TOP OF RISER: Upper 849.89, Lower 849.35 | ELEV PIEZ TIP: 804.7, 796.7

FILTER: #4 Sand | FROM ELEV: Upper 803.7, Lower 795.7 | TO ELEV: 811.7, 799.7

SEAL: Bentonite Pellets | FROM ELEV: Upper 836.7, Lower 799.7 | TO ELEV: 840.7, 803.7

INSTALLED BY: [illegible] | CONTRACT NO.: 0008 | FOREMAN:

DATE OF INSTALLATION: 11/2/[illegible] | DATE OF OBSERVATIONS: 11/3/[illegible]

METHOD OF TESTING PIEZ.: Falling [illegible]

TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
	Lower Piezometer 0	* 0'		Upper Piezometer 0	** 0			
	1	20'		1	28'			
	3	31'		3	28'			
	5	31½'		5	28'			
	10	31½'		10	28'			

REMARKS:

* Water at + 29¾' prior to test.

** Water at + 28' prior to test

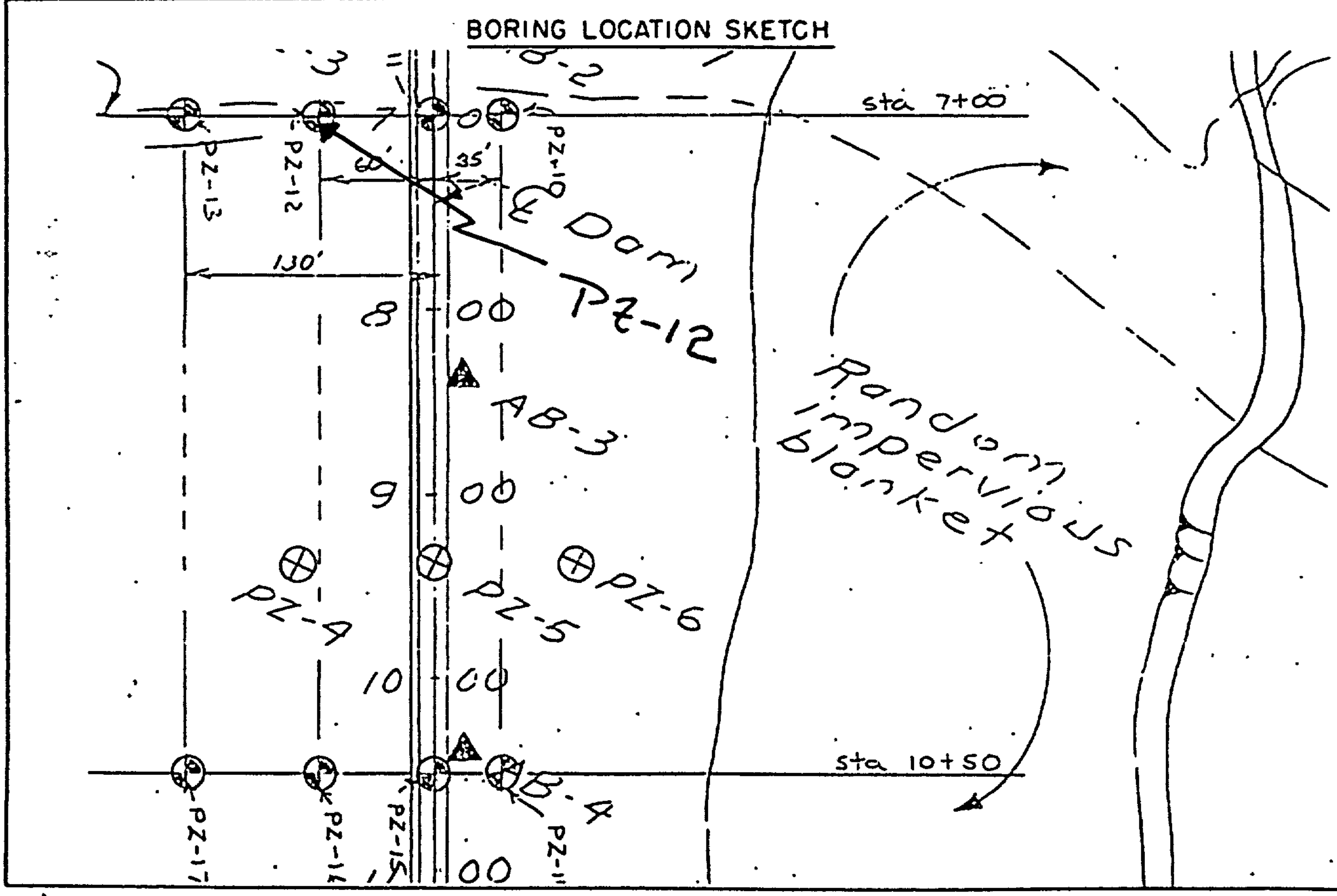
Christopher H. Lawrence
INSPECTOR

Site: Bir[illegible]
Boring No: PZ-12

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER (upper)	DEPTH TO WATER (lower)	ELEVATION WATER (upper)	ELEVATION WATER (lower)	REMARKS
11/11	1:30		51	29	22	819	830	
11/9			51	29 3/4	28'	818 1/4	820	Falling Head Tests
11/[illegible]			51	31 1/2	32	816 1/2	816	
[illegible]			-	30	[illegible]	81?	818	Ground elev. was 846.7 Not 848
11/[illegible]			-	28	[illegible]	[illegible]	819	All elev. should be 1.3 ft lower
11/[illegible]			51	29	[illegible]	819	818	
[illegible]/17			51	27	30	819	818	
11/2[illegible]			51	31	32	817	816	
12/15	1PM			33.8	*	816.1		STATIC
		* Could not obtain reading due to obstruction at 6' - later determined riser was broken; new installation has been made.						

Note: Depths are in feet below original ground



ATLANTIC TESTING LABORATORIES, LIMITED

PIEZOMETER INSTALLATION DETAIL

PROJECT Birch Hill Dam, Ma.

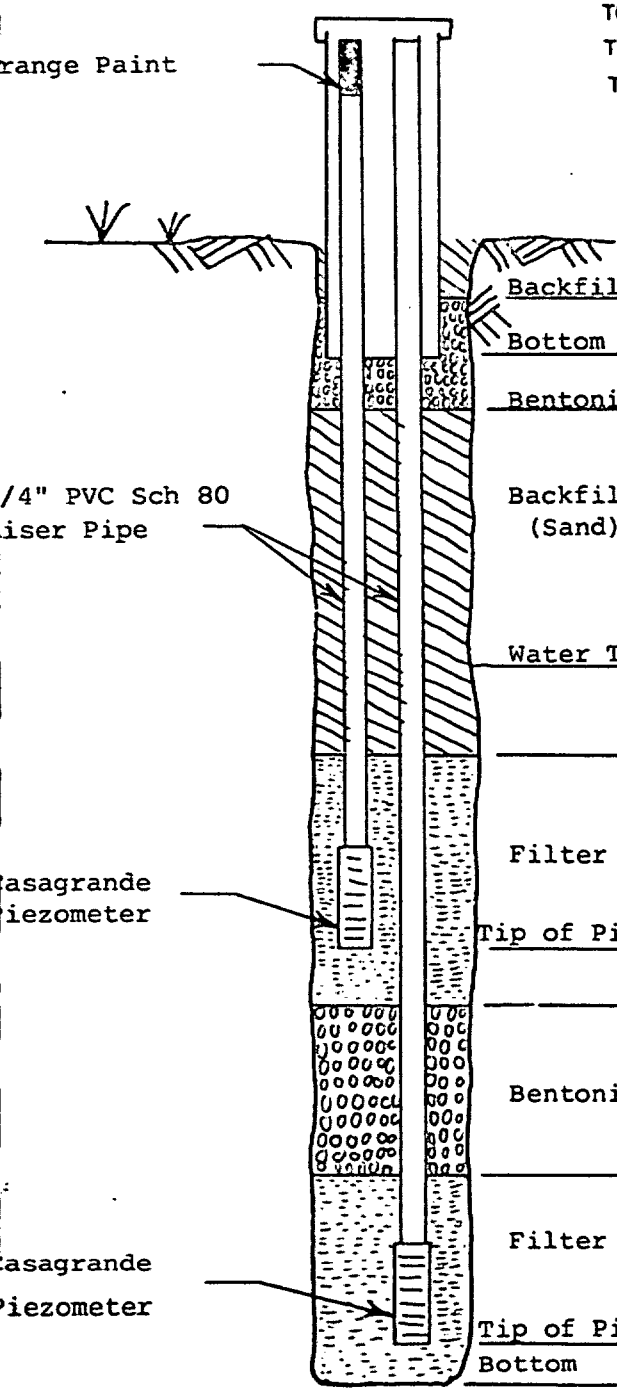
CLIENT U.S. Army Corps of Engineers
Waltham, Massachusetts

CONTRACT No. DACW-33-87-D-0007

ATL PROJECT No. CD033

PIEZOMETER No. PZ-12

TOP PROTECTIVE PIPE 850.20
TOP LOWER PIEZOMETER RISER 849.35
TOP UPPER PIEZOMETER 849.89



SURFACE ELEVATION	846.7'	DEPTH	SOIL STRATA
Backfill	840.7'	6'	No samples as per instructions.
Bottom of Pipe	838.7'	8'	
Bentonite Seal	836.7'	10'	
Backfill (Sand)		28'	
		30'	Yellow brown cmf SAND, little mf GRAVEL, trace SILT (non-plastic) SP - SM
Water Table	▽ 816.1'	30.6'	
	813.4	33.3	Brown mf SAND, trace SILT, trace f GRAVEL (non-plastic) SP - SM
	~~811.7'~~	35'	
		38'	
Filter Sand			Yellow brown cmf SAND, little mf GRAVEL, trace SILT (non-plastic) SP - SM
	806.4	40.3	
Tip of Piezometer	~~804.7'~~	~~42'~~	Per USACE measurement on 1 Feb 89
	803.7'	43'	Light grey SILT, some SAND, little CLAY (very slightly plastic) ML
Bentonite Seal			
	799.7'	47'	
Filter Sand			Lower Piezometer was faulty and replaced on 2/1 + 2/2/89, under the direction of USAEC Representative TONY FIRICANO
Tip of Piezometer	796.7'	50'	
Bottom	795.7'	51'	

ATLANTIC TESTING LABORATORIES, LIMITED

PIEZOMETER INSTALLATION DETAIL

PROJECT Birch Hill Dam, MA

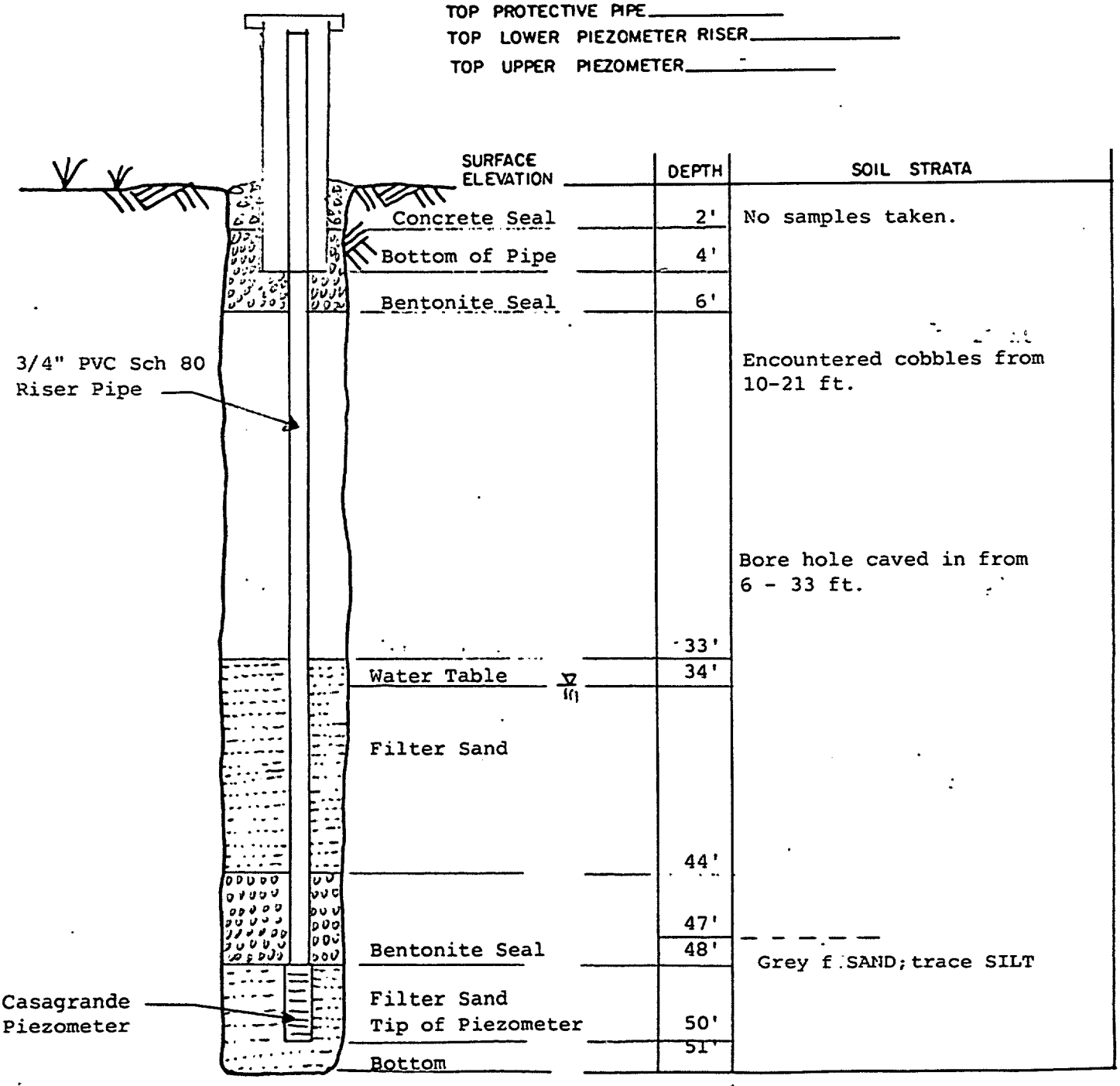
CONTRACT No. DACW-33-87-D-0007

ATL PROJECT No. CD033

CLIENT U.S. Army Corps of Engineers
Waltham, MA

PIEZOMETER No. PZ-12A

Piezometer was installed adjacent to the original piezometer location (PZ-12). Installed 2/1 and 2/2/89.



CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. CD-033

Site Birch Hill Dam — Page 1 of 7 Pages

Hole No. PZ-13 (FD-88-6) Diam. (Casing) 6" SCL — Boring Started 11/10/85

Co-ordinates: N 594935 E 432018 — Boring Completed 11/11/85

Drilled by Todd + Pryce — Report Submitted 12/21/85

Purpose of Exploration Install 2 piezometers.

Elevation Top of Hole 832 M.S.L. — Casing Left in Place 4" DIA. - 10 Feet

Total Overburden Drilled 34 Feet

Elevation Top of Rock ____ M.S.L.

Elevation Bottom of Hole 798 M.S.L.

Total Rock Drilled ____ Feet

Total Depth of Hole 34 Feet

Core Recovered ____ %

Core Recovered ____ Ft.; ____ Dia. ____ In.

Soil Samples 1 3/8" In. Dia. 11 No.

Soil Samples ____ In. Dia. ____ No. — Water Table Depth 18'

Depth From	Depth To	Method of Drilling and Type of Bit Used
0	20	Spun 6" flush coupled casing
0	10	No samples as per instructions
10	32	Continuous sampling
23	25	Upper piezometer (orange)
31	33	Lower piezometer (gray)

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Boring Location Sketch ____ Back of Page 6
Overburden Record Pages 2-4 Page ____
Rock Drilling ____ Page ____
Piezometer Installation Report Page 5
" " Detail Page 7
____ Page ____

Prepared by Christopher H. Lawrence (Field Data) (Lab. Data)

Submitted by ATLANTIC TESTING LABORATORIES

NED FORM DEC 63 121 REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site Birch Hill Dam — Page 2 of 7 Pages

Boring No. P2-13 (FD-88-6) Desig. ____ Diam. (Casing) 6"

Co-ordinates: N 594935 E 432018

Elevation Top of Boring 832 M.S.L. — Hammer Wt. 140 lbs — Boring Started 11/10/55

Total Overburden Drilled 34 Feet — Hammer Drop 30" — Boring Completed 11/11/55

Elevation Top of Rock ____ M.S.L. — Casing Left 10'

Total Rock Drilled ____ Feet — Subsurface Water Data ____ Page 6

Elevation Bottom of Boring 798 M.S.L. — Obs. Well ____

Total Depth of Boring 34 Feet — Drilled By Todd + Pryce

Core Recovered ____ % No. Boxes ____ — Mfg. Des. Drill ____

Core Recovered ____ Ft. ____ Diam. ____ In. — Inspected By: Christopher H. Laurence

Soil Samples 1 3/8 In. Diam. 11 No. — Classification By: Christopher H. Laurence

Soil Samples ____ In. Diam. ____ No. — Classification By: ____

DEPTH	CORE/SAMPLE NO.	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RANGE	BLOWS PER FT. / CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
0					Advance 6" SW flush coupled casing to 20'	N/o samples above 10's as per instruction
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

GENERAL REMARKS:

Site	Boring No.	Page
Bird Hill Dam	PZ-13 FD-88-6	3 of 7

DEPTH (ft)	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. / CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
10	S-1	1 3/8"	70%	31	Sampled with 1 3/8" I.D. Split advanced with 140 lbs hammer.	Lt. Brown, mf, SAND Trace, SILT Trace, GRAVEL SP-SM (NP)
11				30		
				21	Drilled to 14' with 5 7/8" roller bit and water based drilling fluid	
12				29		
13	S-2	1 3/8"	80%	29	Sampled	Similar Soil Little, mf, GRAVEL + Rock Frag SP-SM (NP)
				33		
				21		
14				26		
15	S-3	1 3/8"	85"	36	Sampled Drilled to 18' with 5 7/8" roller bit and water based drilling fluid.	Similar Soil (NP) SP-SM
				22		
				30		
16				36		
17	S-4	1 3/8"	90%	29	Sampled	Similar Soil (NP) SP-SM
				27	OBSTRUCTION AT 18' LOST DRILL WATER. STUCK CASING TO 20'	
				45		
18				28	Water Table	
19	S-5	1 3/8"	0%		Sampled Drilled to 22' with 5 7/8" roller bit and water based drilling fluid.	No Sample because of obstruction @ 18'
20					Bottom of 6" casing	
21	S-6	1 3/8"	90%	24	WATER RECOVERY O.K.	Lt. Brn, cmf, SAND Trace, SILT Little, f, GRAVEL (NP) SP-SM
				30		
				51		
22				62		
23	S-7	1 3/8"	100%	41	Sampled Drilled to 26' with 5 7/8" roller bit and water based drilling fluid	Lt. Brown, Grey, cmf SAND; Trace, SILT Little, mf, GRAVEL + ROCK FRAG. (NP) SP-SM
				39		
				37		
24				25		
25	S-8	1 3/8"	100%	13	Sampled	(B) Grey, cmf, SAND Trace, SILT Trace, f, GRAVEL
				13		
				14		(A) Lt. Grey, SILT, some f SAND Little, clay (NP) CL-ML
26				14		
27	S-9	1 3/8"	100%	7	Sampled Drilled to 30' with 5 7/8" roller bit and water based drilling fluid	Lt. Grey, SILT, some, f SAND Trace, f, GRAVEL
				11		

Site: Birch Hill Dam

Boring No. 72-13 FD-88-6

Page 2 of 7

DEPTH	CORE/SAMPLE NO.	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RUN OR %	BLOWS PER FT. CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
27	S-9	1 3/8"	100%	9		Trace, CLAY (USP)
28				11		ML-CL
	S-10	1 3/8"	100%	6	Sampled	Lt. Grey, SILT, [illegible]
29				6		f, SAND
				5		Some, CLAY (USP)
30				6		ML-CL
	S-11	1 3/8"	95%	6	Sampled	Similar Soil
31				5	Drilled to 34' with 5 7/8"	(USP)
				6	roller bit and water based	
32				6	drilling fluid.	ML-CL
33						
34					Bottom of hole	
					11/10/88 - Complete drilling, sampling.	
					11/11/88 - Set upper piezometer at 25' (orange) lower piezometer 33' grey)	

PIEZOMETER INSTALLATION REPORT

PROJECT: [illegible] | DATE: 11/21/88

LOCATION (STA): PZ-13 | Sta 7+00 | OFFSET FROM CENTER LINE: 130' Left | PIEZ NO.: PZ-[illegible]

PIEZ TYPE: Casagrande | DEPTH OF PIEZ: Upper 23.25, Lower 31.33 | RISER PIPE DIAM: 3/4"

PIEZ TIP SET IN (SOIL TYPE): SP-SM, CL-ML | SOIL SAMPLE NO.: S-7, S-11 | BORING DIAM: 6"

METHOD OF INSTALLATION:

TYPE OF PROTECTION FOR PIEZ: 4" diameter Protective Pipe | VENT: Screw on Cap

GROUND ELEV.: 832.5 | ELEV. TOP OF RISER: Upper 834.64, Lower 834.62 | ELEV PIEZ TIP: Upper 807.5, Lower 799.5

FILTER: #4 Sand | FROM ELEV: Upper 806.5, Lower 778.5 | TO ELEV: Upper 814.5, Lower 802.5

SEAL: Bentonite Pellets | FROM ELEV: Upper 822.5, Lower 802.5 | TO ELEV: Upper 826.5, Lower 806.5

INSTALLED BY: [illegible] | CONTRACT NO.: 0008 | FOREMAN:

DATE OF INSTALLATION: 11/11/88 | DATE OF OBSERVATIONS: 11/21/[illegible]

METHOD OF TESTING PIEZ.: Falling Head Test

TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
	Lower 0	0'*		Upper 0	0'**			
	Piezometer 1/2	15'		Piezometer 1/2	15'			
	Piezometer 1	15'		Piezometer 1	17 1/2			
	Lower 5	15'		Upper 5	17 1/2			
	Lower 10	15'		Upper 10	17 1/2			

REMARKS:

* Water at 18' prior to test.

** Water at 17 1/2' prior to test.

Christopher H. Lawrence
INSPECTOR

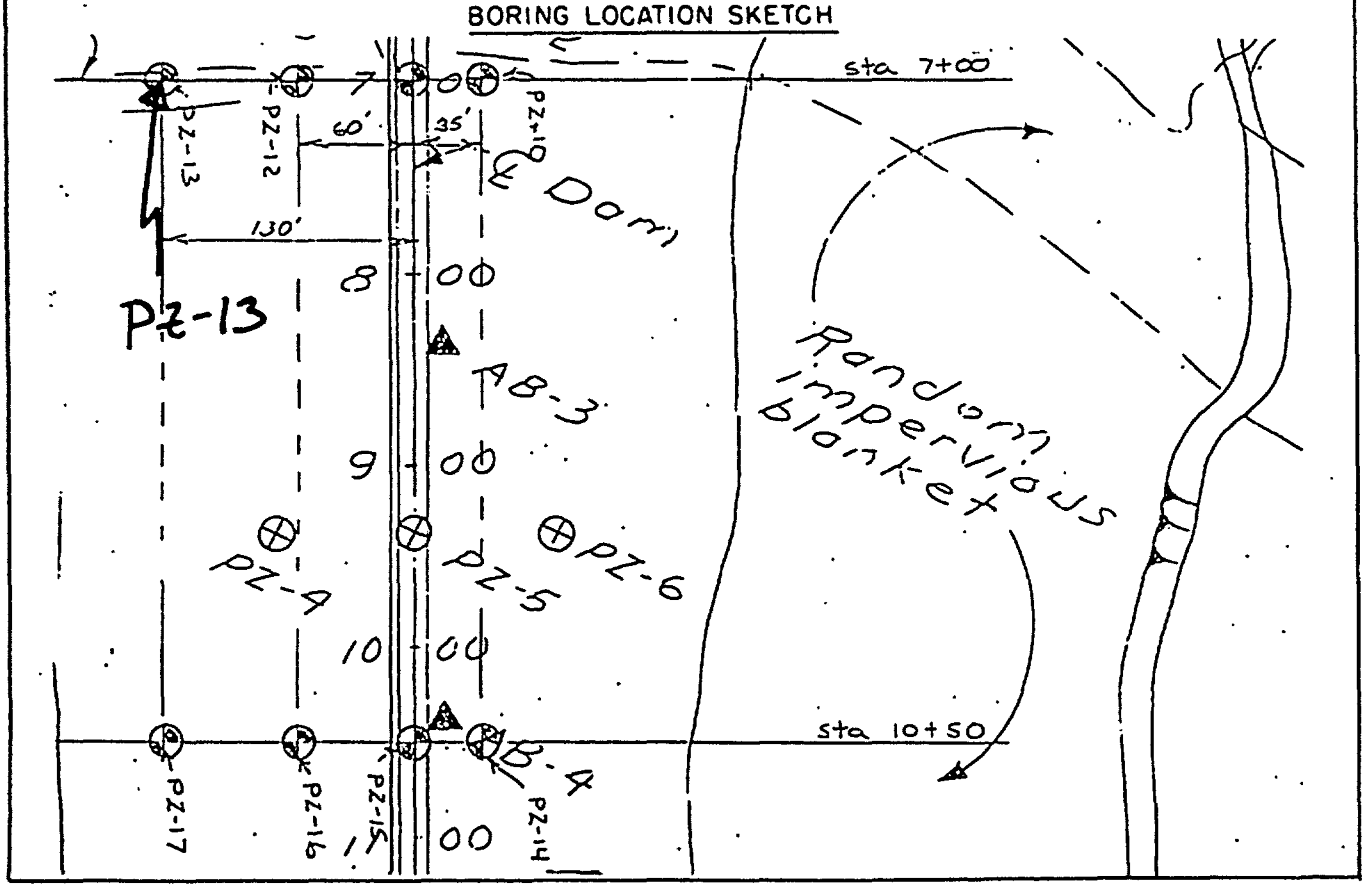
Site: [illegible]
Boring No: PZ-17

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER		ELEVATION WATER		REMARKS
				Upper	Lower	Upper	Lower	
11/14			34'	18½	18¾	813½	813¼	
11/15			34'	18	18½	814	813½	
11/17			34'	18¼	18¼	813¾	813¾	
11/19			34	18	18	814	814	
11/21			34	17½	18	814¼	814	Falling [illegible]
12/15	1 PM			19.0	19.1	815 6	8155	STATIC

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



ATLANTIC TESTING LABORATORIES, LIMITED atl

PIEZOMETER INSTALLATION DETAIL

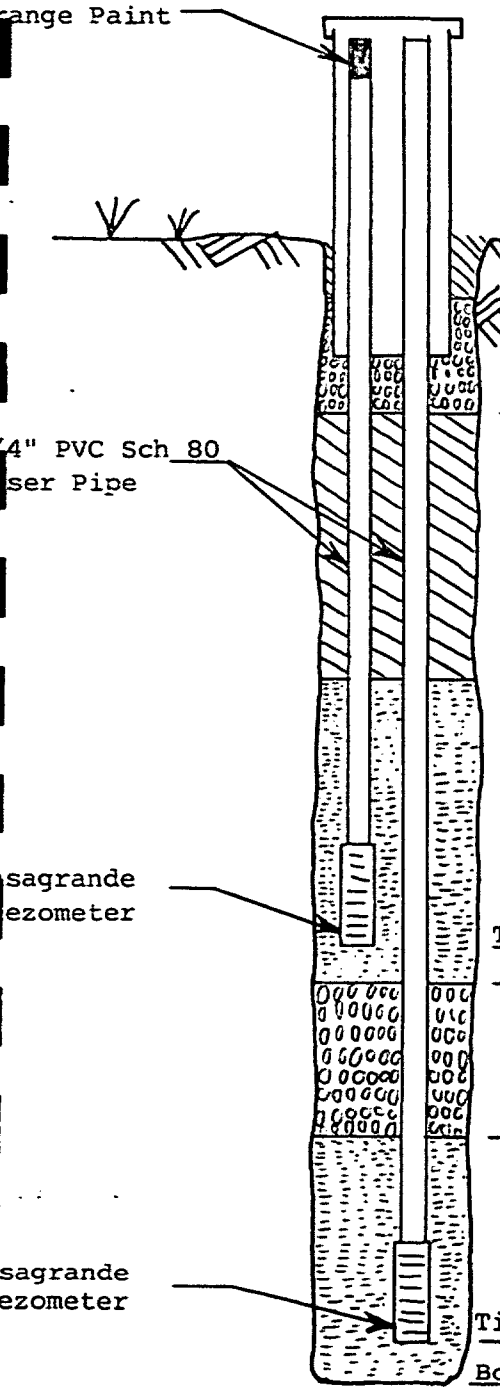
PROJECT Birch Hill Dam, Ma.

CONTRACT No. DACW-33-87-D-0007

ATL PROJECT No. CD033

CLIENT U.S. Army Corps of Engineers
Waltham, Massachusetts

PIEZOMETER No. PZ-13



TOP PROTECTIVE PIPE 835.22
TOP LOWER PIEZOMETER RISER 834.62
TOP UPPER PIEZOMETER 834.64

SURFACE ELEVATION	832.5'	DEPTH	SOIL STRATA
Backfill	826.5'	6'	No samples as per instructions.
Bottom of Pipe	824.5'	8'	
Bentonite Seal	822.5'	10'	
Backfill (Sand)			Light brown mf SAND, trace SILT, trace GRAVEL and ROCK FRAGMENTS (non-plastic) SP-SM
Water Table	814.5'	18'	
		20'	No sample because of an obstruction.
Filter Sand			Light brown cmf SAND, little f GRAVEL, trace SILT (non-plastic) SP - SM
	808.8	23.7	
Tip of Piezometer	~~807.5'~~	~~25'~~	
	~~806.5'~~	26'	Light grey SILT, some f SAND, little CLAY (very slightly plastic) ML - CL
	808.0	24.5	
		28'	
	804.0	28.5	Light grey SILT, some f SAND, some CLAY (very slightly plastic) ML - CL
	~~802.5'~~	~~30'~~	
Filter Sand			
	801.0	31.5	P.- USACE measurement: ~ 1 Feb 88
Tip of Piezometer	~~799.5'~~	~~33'~~	
Bottom	798.5'	34'	

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. CD-033

Site Birch Hill Dam — Page 1 of 8 Pages

Hole No. P7-16 (FD-88-7) Diam. (Casing) 6" SW — Boring Started 11/16/88

Co-ordinates: N 594577 E 432055 — Boring Completed 11/18/88

Drilled by Todd + Pryor — Report Submitted 12/21/88

Purpose of Exploration Install 2 piezometers.

Elevation Top of Hole 548 M.S.L. — Casing Left in Place 4" Dia. - 10 Feet

Total Overburden Drilled 49' Feet

Elevation Top of Rock ____ M.S.L.

Elevation Bottom of Hole ____ M.S.L.

Total Rock Drilled ____ Feet

Total Depth of Hole 49' Feet

Core Recovered ____ %

Core Recovered ____ Ft.: ____ Diam. ____ In.

Soil Samples 1 3/8" I.D. In. Diam. 11 No.

Soil Samples ____ In. Diam. ____ No. — Water Table Depth ≃ 30'

Depth From	Depth To	Method of Drilling and Type of Bit Used
0	15	Spun 6" SW flush coupled casing
15	49	Drilled open hole with 5 7/8" roller bit
0	26	No samples as per instructions
26	45	Continuous samples
46	48	Lower Piezometer (green)
24	36	Upper Piezometer (orange)

INDEX

Ground Water ____ Back of Page 7
Boring Location Sketch ____ Back of Page ____
Overburden Record Pages 2-5 Page ____
Rock Drilling ____ Page ____
Piezometer Installation Report Page 6
" " Detail Page 8
____ Page ____

Prepared by Christopher H. Lawrence
Field Data — Lab. Data

Submitted by Atlantic Testing Laboratories

NED FORM DEC 63 121 — REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site Birch Hill Dam — Page 2 of 8 Pages

Boring No. P2-16 (FD-88-7) Desig. ____ Diam. (Casing) 6"

Co-ordinates: N 594577 E 432055

Elevation Top of Boring 848 M.S.L. — Hammer Wt. 140 — Boring Started 11/16/88

Total Overburden Drilled 49 Feet — Hammer Drop 30" — Boring Completed 11/17/88

Elevation Top of Rock ____ M.S.L. — Casing Left ____

Total Rock Drilled ____ Feet — Subsurface Water Data ____ Page 7

Elevation Bottom of Boring 799 M.S.L. — Obs. Well ____

Total Depth of Boring 49 Feet — Drilled By Todd + Price

Core Recovered ____ % No. Boxes ____ — Mfg. Des. Drill ____

Core Recovered ____ Ft : ____ Diam. ____ In. — Inspected By: Christopher H. Lawrence

Soil Samples 1 3/8 I.D. In. Diam. 11 No. — Classification By: Christopher H. Lawrence

Soil Samples ____ In. Diam. ____ No. — Classification By: ____

DEPTH	CORE/SAMPLE NO.	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RANGE	BLOWS PER FT. CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
0					Advanced 6" SW flush coupled casing to 15'.	No samples collected above 26' as per instructions.
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

GENERAL REMARKS:

Site: Birch Hill Dam

Boring No. PZ-16 FD-88-7

DEPTH (ft.)	CORE/SAMPLE NO.	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RANGE	BLOWS PER FT. / CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
10						
11						
12						
13						
14						
15					Bottom of 6" casing. Below 15' the drilling was open hole with a 5⅞" roller bit and water based drilling fluid to keep the hole open.	
16						
17						
18					— Water Table	
19						
20						
21						
22						
23						
24						
25						
26	S-1	1 3/16"	80%	59	Sampled with 1⅜" I.D. spoon advanced with 140 lbs hammer.	Brown, mf, SAND Trace, m, ROCK FRAGM... Trace SILT SP-SM
27				71		

Site: Birch Hill Dam

Boring No. PZ-16 FD-88-7

DEPTH	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. / CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
27–28	S-1	1 3/8"	80%	39, 54		
28–30	S-2	1 3/8"	70%	71, 74, 105	Sampled 5" penetration - no problem drilling through	(A) Lt. Brown, f, SAND Trace, SILT (B) Yellow Brown, mf, SAND Trace, SILT Trace, mf, GRAVEL (NP) SP-SW
30–32	S-3	1 3/8"	80%	41, 56, 67, 100	Sampled Drilled and washed to a depth of 34' with 5 7/8" roller bit and water based drilling fluid. End Drilling 11/16/88	Similar Soil to (B) SP-SM..
32–34	S-4	1 3/8"	10%	100, Bouncing	Sampled 4" penetration - Drilled through in about 10 min. 3" penetration - Drilled through in about 15 min.	No sample because of obstruction
34–36	S-5	1 3/8"	70%	20, 31, 29, 40	Sampled Drilled and washed to 38' with 5 7/8" roller bit and water based drilling fluid.	Dk Brown, mf, SAND Trace, SILT (NP) SP-SM
36–38	S-6	1 3/8"	80%	25, 24, 36, 32	Sampled	Lt. Brown, mf, SAND Trace, SILT (NP). SP-SM
38–40	S-7	1 3/8"	70%	10, 8, 8, 14	Sampled Drilled and washed to 42' with 5 7/8" roller bit and water based drilling fluid.	Lt. Grey, SILT, some f, SAND (VSP) ML
40–42	S-8	1 3/8"	70%	9, 12, 13, 14	Sampled	Same Soil (VSP) ML
42–44	S-9	1 3/8"	80%	8, 12, 18, 14	Sampled. Drilled and washed to 46' with 5 7/8" roller bit and water based drilling fluid.	Same Soil (VSP) ML

FORM 58A (Test)

Boring No. FD-88-7

Site	Boring No.	Page 5 of 9
Birch Hill Dam	PZ-16 FD-88-7	

DEPTH	CORE/SAMPLE NO.	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RUN	BLOWS PER FT. / CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
44				14	Sampled	Same Soil (USP) ML
45	S-10	1 3/8"	60%	11 15		
46				15		
46				7	Sampled Drilled and washed to 49' with 5 7/8" roller bit and water based drilling fluid.	Same Soil (USP) ML
47	S-11	1 3/8"	85%	8 17		
48				32		
49					Bottom of hole. 11/17/88 - Finished drilling and set piezometers. Upper piezometer at 36' (orange) Lower piezometer 42' (grey) 11/18/88 Finished piezometers and set protective pipe	

PIEZOMETER INSTALLATION REPORT

PROJECT: Birch Hill Dam | DATE: 11/19/82

LOCATION (STA): PZ-16 Sta 10+50 | OFFSET FROM CENTER LINE: 60' Left | PIEZ NO.: PZ-16

PIEZ TYPE: Casagrande | DEPTH OF PIEZ: Upper 34-36, Lower 46-48 | RISER PIPE DIAM: 3/4"

PIEZ TIP SET IN (SOIL TYPE): Upper SP-SM, Lower ML | SOIL SAMPLE NO.: S-5, S-11 | BORING DIAM: 6"

METHOD OF INSTALLATION:

TYPE OF PROTECTION FOR PIEZ: 4" diameter Protective Pipe | VENT: Screw on Cap

GROUND ELEV.: 848.4 | ELEV. TOP OF RISER: Upper 850.88, Lower 850.97 | ELEV PIEZ TIP: 800.4, 812.4

FILTER: #4 Sand | FROM ELEV: Upper 810.4, Lower 799.4 | TO ELEV: 818.4, 806.4

SEAL: Bentonite Pellets | FROM ELEV: Upper 840.4, Lower 806.4 | TO ELEV: 842.4, 810.4

INSTALLED BY: Emil, Terra | CONTRACT NO.: CC08 | FOREMAN:

DATE OF INSTALLATION: 11/ /82 | DATE OF OBSERVATIONS: 11/17/82

METHOD OF TESTING PIEZ.: Falling Head Test

TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
Reset	0	0'*	Reset	0	0'**			
Reset	1/2	31	Reset	1/2	32			
Reset	1	31 1/2	Reset	1	26			
Reset	2	31 1/2	Reset	2	26 1/2			
Reset	5	31 1/2	Reset	5	26 1/2			

REMARKS:

* Water at 31 1/2' prior to test.

** Water at 26 1/2' prior to test.

Christopher H. Lawrence
INSPECTOR

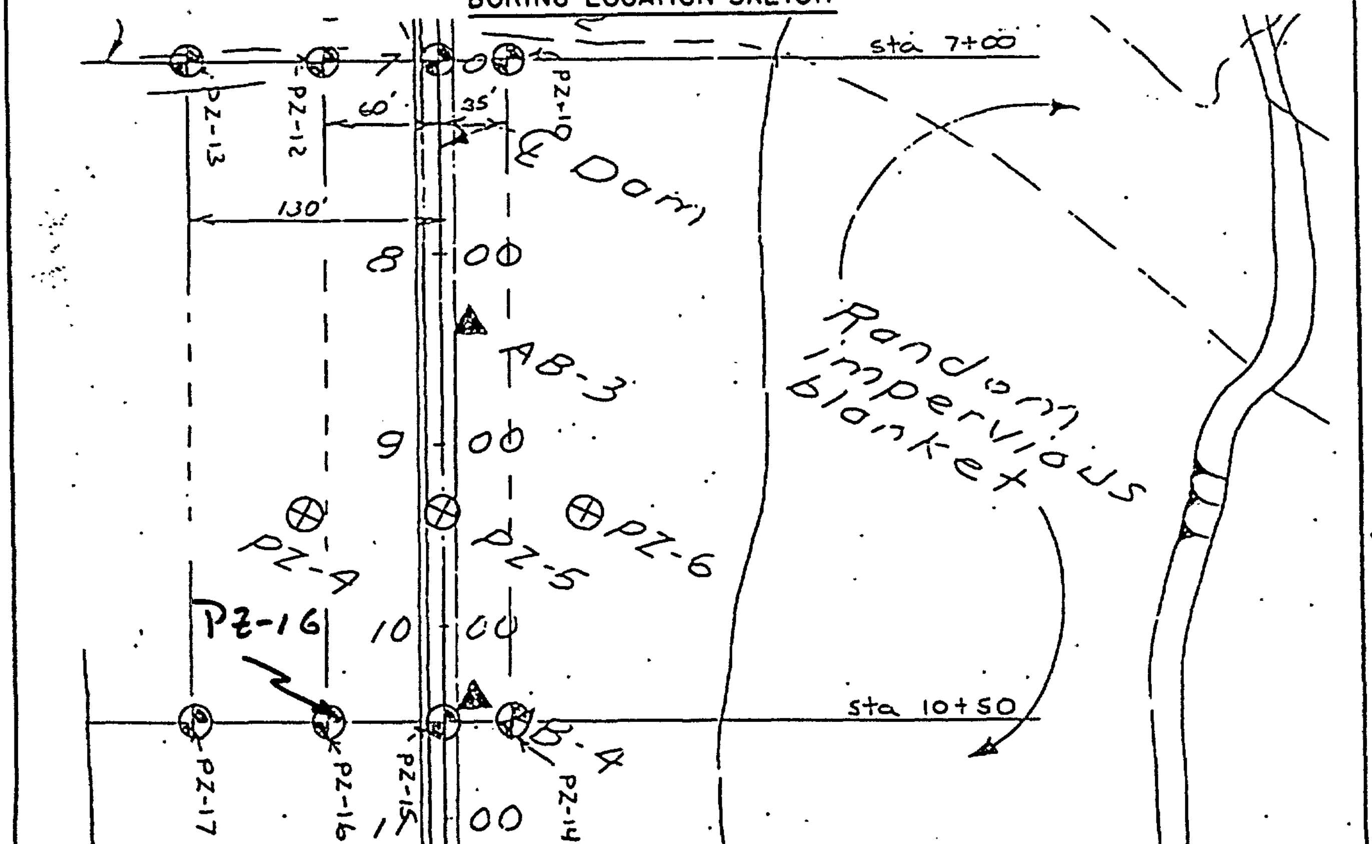
Site: [illegible]
Boring No: [illegible]

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER		ELEVATION WATER		REMARKS
				Upper	Lower	Upper	Lower	
11/1[illegible]			--	28	25	830	825	
11/1[illegible]			--	26	31	824	819	
[illegible]			[illegible]	26½	31½	823½	818½	Falling Head Test
11/21			[illegible]	27	32	823	818	
12/15	1PM			33.1	32.4	817.8	818.6	STATIC

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



ATLANTIC TESTING LABORATORIES, LIMITED

PIEZOMETER INSTALLATION DETAIL

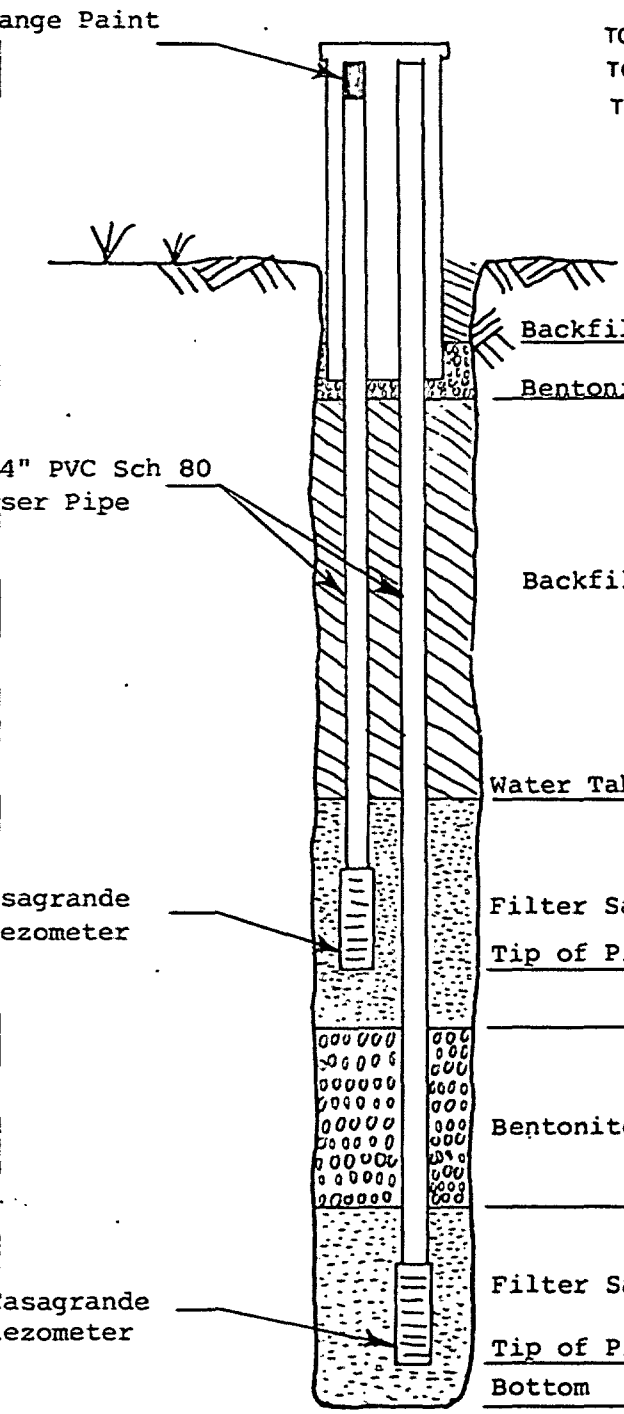
PROJECT Birch Hill Dam, Ma.

CONTRACT No. DACW-33-87-D-0007

ATL PROJECT No. CD033

CLIENT U.S. Army Corps of Engineers
Waltham, Massachusetts

PIEZOMETER No. PZ-16



TOP PROTECTIVE PIPE 851.67
TOP LOWER PIEZOMETER RISER 850.97
TOP UPPER PIEZOMETER 850.88

		DEPTH	SOIL STRATA
SURFACE ELEVATION	848.4'		
Backfill	842.4'	6'	No samples as per instructions.
Bentonite Seal	840.4'	8'	
Backfill		26'	
Water Table ▽ 5/31	819.8 ~~818.4'~~	28.6 ~~30'~~	Brown and yellow-brown mf SAND, trace SILT, trace GRAVEL (non-plastic) SP - SM
		32'	
Filter Sand		34'	No sample because of an obstruction.
Tip of Piezometer	813.8 ~~812.4'~~	34.6 ~~36'~~	Brown mf SAND, trace SILT (non-plastic) SP - SM
	~~810.4'~~	~~38'~~	
Bentonite Seal	811.9 807.9 ~~806.4'~~	36.5 40.5 ~~42'~~	Light grey SILT, some f SAND (very slightly plastic) ML
Filter Sand			
Tip of Piezometer	801.9 ~~800.4'~~	46.5 ~~48'~~	Per USACE measurements on 1 Feb 89
Bottom	799.4'	49'	

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. CD-033

Site Birch Hill Dam — Page 1 of 7 Pages

Hole No. P2-17 / FD-88-8 — Diam. (Casing) 6" SW — Boring Started 11/19/88

Co-ordinates: N 594578 E 431981 — Boring Completed 11/21/88

Drilled by Todd + Pryce — Report Submitted 12/21/88

Purpose of Exploration Install 2 piezometers.

Elevation Top of Hole 833 M.S.L. — Casing Left in Place 4" DIA. 10 Feet

Total Overburden Drilled 34 Feet

Elevation Top of Rock ____ M.S.L.

Elevation Bottom of Hole ____ M.S.L.

Total Rock Drilled ____ Feet

Total Depth of Hole 34 Feet

Core Recovered ____ %

Core Recovered ____ Ft.; ____ Diam. ____ In.

Soil Samples 1 3/8 I.D. In. Diam. 11 No.

Soil Samples ____ In. Diam. ____ No. — Water Table Depth ≃ 17'

Depth From	Depth To	Method of Drilling and Type of Bit Used
0	15	Spun 6" SW Flush Coupled Casing
10	34	Drilled Open hole with roller bit
0	10	No samples as per instructions
10	32	Continuous Samples
33	31	Lower Piezometer (grey)
24	22	Upper Piezometer (orange)

Index

Ground Water ____ Back of Page 6
Boring Location Sketch ____ Back of Page 6
Overburden Record pages 2-4 Page ____
Rock Drilling ____ Page ____
Piezometer Installation Report Page 5
Detail Page 7
____ Page ____

Prepared by Christopher H. Lawrence — Field Data / Lab. Data

Submitted by ATLANTIC TESTING LABORATORIES

NED FORM DEC 63 121 — REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site Birch Hill Dam — Page 2 of 7 Pages

Boring No. P3-17 (FD88-8) Desig. ____ Diam. (Casing) 6"

Co-ordinates: N 594578 E 431981

Elevation Top of Boring 832 M.S.L. — Hammer Wt. 140 — Boring Started 11/17/82

Total Overburden Drilled 34 Feet — Hammer Drop 30" — Boring Completed 11/21/82

Elevation Top of Rock ____ M.S.L. — Casing Left ____

Total Rock Drilled ____ Feet — [Subsurface Water Data] ____ Page 6

Elevation Bottom of Boring 798 M.S.L. — Obs. Well ____

Total Depth of Boring 34 Feet — Drilled By Todd + Pryce

Core Recovered ____ % No. Boxes ____ — Mfg. Des. Drill ____

Core Recovered ____ Ft : ____ Diam. ____ In. — Inspected By: Christopher H. Lawrence

Soil Samples 1 3/8" I.D. In. Diam. 11 No. — Classification By: Christopher H. Lawrence

Soil Samples ____ In. Diam. ____ No. — Classification By: ____

DEPTH	CORE/SAMPLE NO.	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RANGE	BLOWS PER FT. CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
0					Advanced 6" SW flush coupled casing to 10'. The hole was moved about 5' south because of large bolders with Tony Firicano's permission. The hole is at the same elevation.	No samples above 10' as per instructions.
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

GENERAL REMARKS:

Site: Birch Hill Dam | Boring No. P2-17 FD-88-8 | Page 3 of 7

DEPTH (ft)	CORE/SAMPLE NO.	SIZE	DEPTH RUN	BLOWS PER FT. / CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
10	S-1	1 3/8"	20%	16	Sampled Drilled open hole with 5 7/8" roller bit and washed to 14'. Hole was kept open with a drilling fluid.	Lt Brown + Grey, mf, SAND Trace, SILT Little, mf, GRAVEL (NP) SP-SM
11				12		
12	S-2	1 3/8"	70%	36	Sampled Drilled open hole and washed to 14'.	Similar Soil Trace, ROCK FRAG. (NP) SP-SM.
13				53		
14				58		
14	S-3	1 3/8"	0%	20	Obstruction - 0" penetration with spoon. Drilled about 1½ hours before breaking through the rock at 17'	No Sample because of obstruction.
15						
16	S-4	1 3/8"	0%	.5	6" casing was advanced to a depth of 15' by spinning. Rest of hole was drilled as open hole.	No Sample because of obstruction.
17				Bouncing		
18	S-5	1 3/8"	60%	17	Sampled Drilled + washed to 22'	Dark Red Brown, mf, SAND Trace, SILT (NP) SP-SM
19				22		
20				28		
21				19		
21	S-6	1 3/8"	70%	9	Sampled	Similar Soil (NP) SP-SM
22				14		
23				14		
24				13		
24	S-7	1 3/8"	70%	8	Sampled Drilled and washed to 26'	Lt. Brown, mf, SAND Trace, SILT Trace, ROCK FRAGMENTS (NP) SP-SM
25				16		
26				13		
26	S-8	1 3/8"	20%	12	Sampled	Grey + Brown, mf, SAND Trace, SILT Trace, GRAVEL (NP) SP-SM
27				6		
28				8		
29				13		
30				25		
30	S-9	1 3/8"	5%	3	Sampled Drilled and washed to 30'	Lt. Grey, SILT, some, f, SAND ML
31				4		

Site	Boring No.	Page
Birch L. (Dam	P2-17 FD-88-8	4 of 7

DEPTH (ft)	CORE/SAMPLE NO.	SIZE	DEPTH RUN	BLOWS PER FT. / CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
27	S-9	1 3/8"	20"	3		(USP)
28				6		
				3	Sampled	Similar Soil (USP) ML
29	S-10	1 3/8"	30"	2		
				4		
30				5		
				5	Sampled	Similar Soil (USP) ML
31	S-11	1 3/8"	90%	6	Drilled and washed to 34'.	
				9		
32				15	11/19/88 End Drilling & Sampling	
					Washed hole to 34' with 5 7/8" roller bit.	
33						
34					11/20/88 - Set piezometers + protective pipe	

PIEZOMETER INSTALLATION REPORT

PROJECT: Bird Hill Dam | DATE: 11/21/88

LOCATION (STA): PZ-17 Sta 10+50 | OFFSET FROM CENTER LINE: 150' Left | PIEZ NO.: PZ-17

PIEZ TYPE: Casagrande | DEPTH OF PIEZ: Upper 22-24, Lower 31-33 | RISER PIPE DIAM: 3/4"

PIEZ TIP SET IN (SOIL TYPE): Upper SP-SM, Lower ML | SOIL SAMPLE NO.: S-7, S-11 | BORING DIAM: 6"

METHOD OF INSTALLATION:

TYPE OF PROTECTION FOR PIEZ: 4" diameter Protective Pipe | VENT: Screw on Cap

GROUND ELEV.: 831.8 | ELEV. TOP OF RISER: Upper 834.39, Lower 834.38 | ELEV PIEZ TIP: 807.8, 798.8

FILTER: #4 Sand | FROM ELEV: Upper 805.8, Lower 797.8 | TO ELEV: 814.8, 801.8

SEAL: Bentonite Pellets | FROM ELEV: Upper 823.8, Lower 801.8 | TO ELEV: 827.8, 805.8

INSTALLED BY: Randy Todd | CONTRACT NO.: 0008 | FOREMAN:

DATE OF INSTALLATION: 11/19/88 | DATE OF OBSERVATIONS: 11/21/88

METHOD OF TESTING PIEZ.: Falling Head Test

TIME	ELAPSED TIME - MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME - MINUTES	DEPTH TO WATER FEET	TIME	ELAPSED TIME MINUTES	DEPTH TO WATER FEET
	Lower 0	0'*		Upper 0	0'*			
	1/2	12'		1/2	16'			
	Pz 1	13 1/2		Piezometer 1	15 1/2			
	5	15 1/2		Upper 5	15 1/2			
	Lower 10	15 1/2		Upper 10	13 1/2			

REMARKS:

* Water level at 18 1/2' prior to test.

* Water level at 18 1/2' prior to test.

Christopher H. Lawrence
INSPECTOR

Site: [illegible]

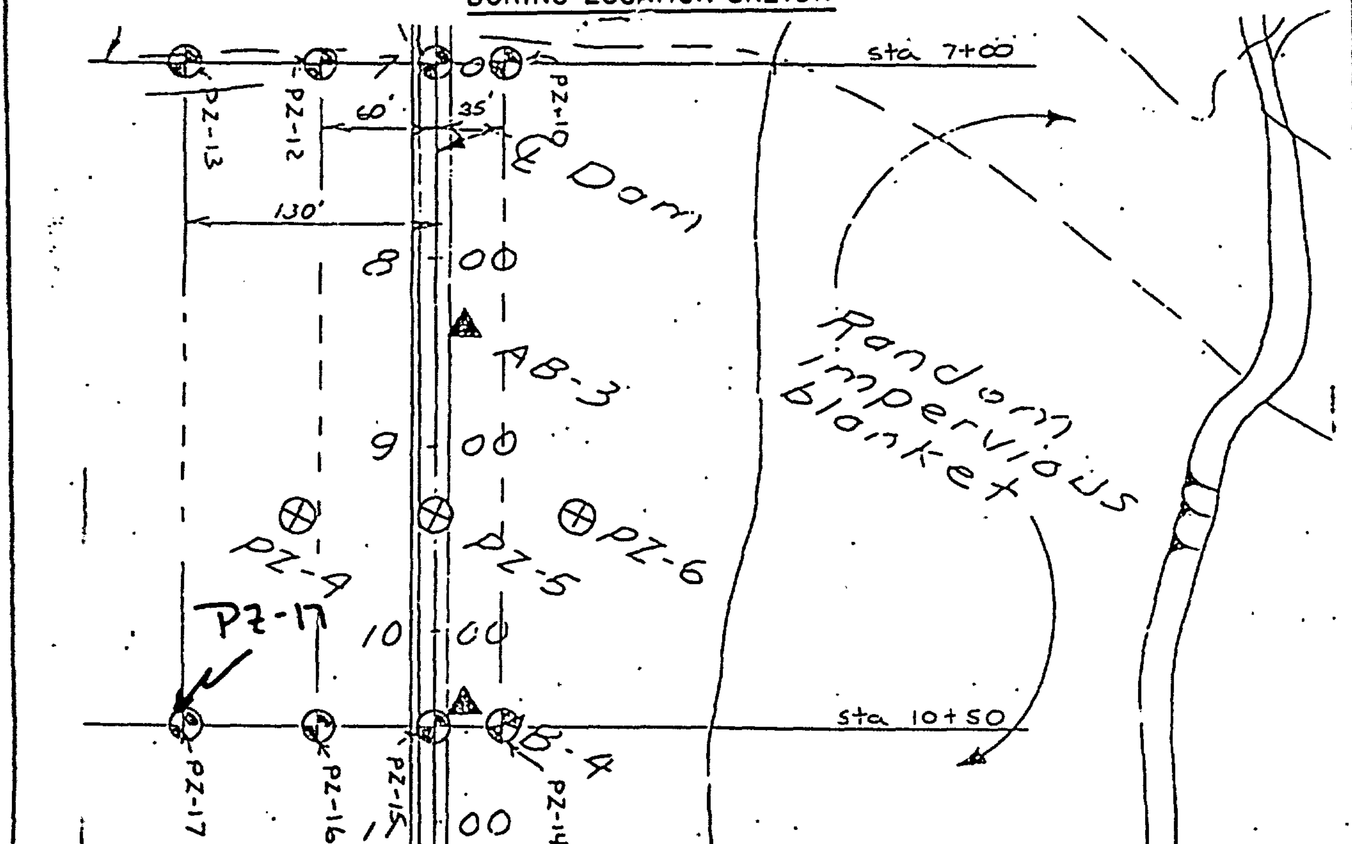
Boring No: PZ-17

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
				Upper Lower	Upper Lower	
11/21	4:00		34	13 ½ : 13 ½	[illegible] 3½ | 813½	Falling Head Tests
11/22	9:01		34	15½ | 15	813¾ | 814	
12/15	1PM			17.0 , 17.0	817.5 817.4	STATIC

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



ATLANTIC TESTING LABORATORIES, LIMITED

PIEZOMETER INSTALLATION DETAIL

PROJECT Birch Hill Dam, Ma.

CONTRACT No. DACW-33-87-D-0007

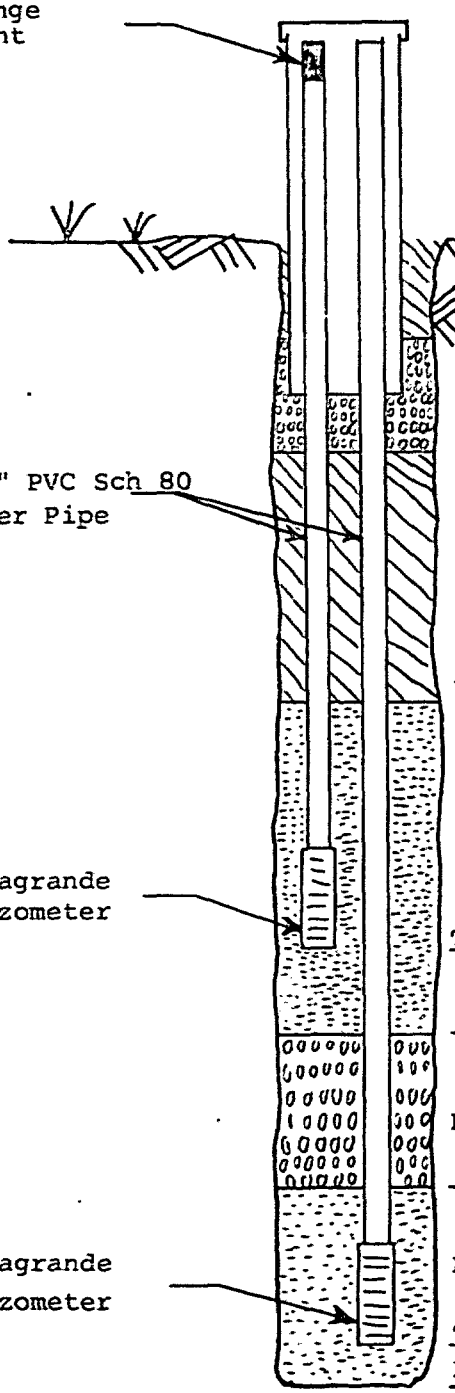
ATL PROJECT No. CD033

CLIENT U.S. Army Corps of Engineers
Waltham, Massachusetts

PIEZOMETER No. PZ-17

range
aint

TOP PROTECTIVE PIPE 834.70
TOP LOWER PIEZOMETER RISER 834.38
TOP UPPER PIEZOMETER 834.49



		DEPTH	SOIL STRATA
SURFACE ELEVATION	831.8'		No samples as per instructions.
Backfill	827.8'	4'	
Bottom of Pipe	825.8'	6'	
Bentonite Seal	823.8'	8'	
		10'	
Backfill		14'	Light brown and grey mf SAND, trace SILT, little mf GRAVEL (non-plastic) SP - SM
Water Table ▽	814.8'	17'	No sample because of an obstruction.
		18'	
Filter Sand			Dark red brown mf SAND, trace SILT (non-plastic) SP - SM
	809.9	21.9	
Tip of Piezometer	~~807.8'~~	~~24'~~	
	805.8'	26'	
Bentonite Seal			Light grey SILT, some f SAND (very slightly plastic) ML
	803.7	29.1	
	~~801.8'~~	~~30'~~	
Filter Sand			
	800.7	31.1	Per USACE measurements on 1 Feb 89
Tip of Piezometer	~~798.8'~~	~~33'~~	
Bottom	797.8'	34'	

Birch Hill Dam Drawings

General Plan

Piezometer Location Plan

Cross-Section (3)

Piezometer Installation Detail (2)

ELEVATION OF SPILLWAY

SCALE 1" = 100'

DOWNSTREAM ELEVATION OF DAM

SCALE 1" = 100'

700 0+00 5+00 10+00 15+00 700

INTAKE CHANNEL

Diversion cofferdam Top El. 820.0

Note: Water pipe and electric duct not shown See Sheet No. 16.

N 3268.91
E 4503.30

OPERATING HOUSE

UTILITY BUILDING

OPERATOR'S QUARTERS

Settlement gages

CHANNEL SILL

Fill stream channel with spoil material.

B. & M. Railroad to be relocated by others.

limit of random impervious blanket

Cofferdam top 832.0 (To be part of completed embankment) for cross section see Sheet No. 11 and 12.

R.R. fill to be removed.

Limits of first season's construction Top El. 861.0.

Sta. 17+20
N. 4050.67
E. 3573.50

OUTLET CHANNEL

MILLERS RIVER

Approx. location temporary downstream cofferdam. Top El. 823.0.

Transition to 1on 2.5 slope

5'-0" drainage ditch

Cart path

5'-0" drainage ditch

Boulder

Power cable in 2" conduit

Terminal pole to be installed by others

Pothead

(N 1575.77
E 4150.71

ROTARY

Grade for parking area

Excavated material to be placed in random section of dam or spoiled as directed

ACCESS ROAD

To Southampton

UPSTREAM

Guard rail post, 1'-0" gravel

Spillway crest El. 852.0
3'-0" dumped rock

Top of dam. El. 864.0

Random Impervious blanket

El. 840.0

Pervious

Random Impervious

Dumped rock

Rock toe

6" stripping

Ground El. 820.0 ± 50' stripping

Impervious cut-off trench

NOTES

Elevations refer to Mean Sea Level Datum.
Contour Interval, 5 feet except as shown.
Figures in hexagons indicate item numbers under which payment will be made.
For details of Embankment see Sheets No. 11 & 12.
For details of Outlet Works see Sheets No. 15 to 28 incl.
For details of Spillway see Sheets No. 13 & 14.
For details of Operating House see Sheets No. 33 to 38 incl.
For details of Access Road see Sheets No. 39 to 43 incl.
• indicates settlement gage.
• indicates staff gage.

TYPICAL CROSS SECTION OF DAM

SCALE: 1" = 40'

RECORD DRAWINGS

1	11/17/41	Incoming service and conduit added	
2	10/30/41	Fill for Operator's Quarters added	
3	10/10/41	Drainage ditch added	
4	5/14/41	Channel grade changed.	
5	10/29/40	Cleaning gate added	

CONNECTICUT RIVER FLOOD CONTROL

BIRCH HILL DAM

GENERAL PLAN

MILLERS RIVER MASSACHUSETTS

IN 50 SHEETS SCALE: 1 IN. = 100 FT. SHEET NO 10

U. S. ENGINEER OFFICE, PROVIDENCE, R. I. JAN. 1940

SUBMITTED APPROVAL RECOMMENDED APPROVED

INTAKE CHANNEL

850

+815±

UPSTEAM

Invert El. 815'

UTILITY BUILDING

825

Sta. 7+00

Sta. 10+50

Random impervious blanket

PZ-1

AB-1

AB-2

PZ-10

Dam

AB-3

PZ-6

PZ-5

AB-4

PZ-14

PZ-7

AB-5

ROTARY

PZ-11

PZ-15

PZ-2

PZ-3

PZ-12

PZ-16

PZ-4

PZ-8

PZ-9

PZ-13

PZ-17

35'

8'

130'

OPERATORS QUARTERS

TT-20-D1

TT-20-DA

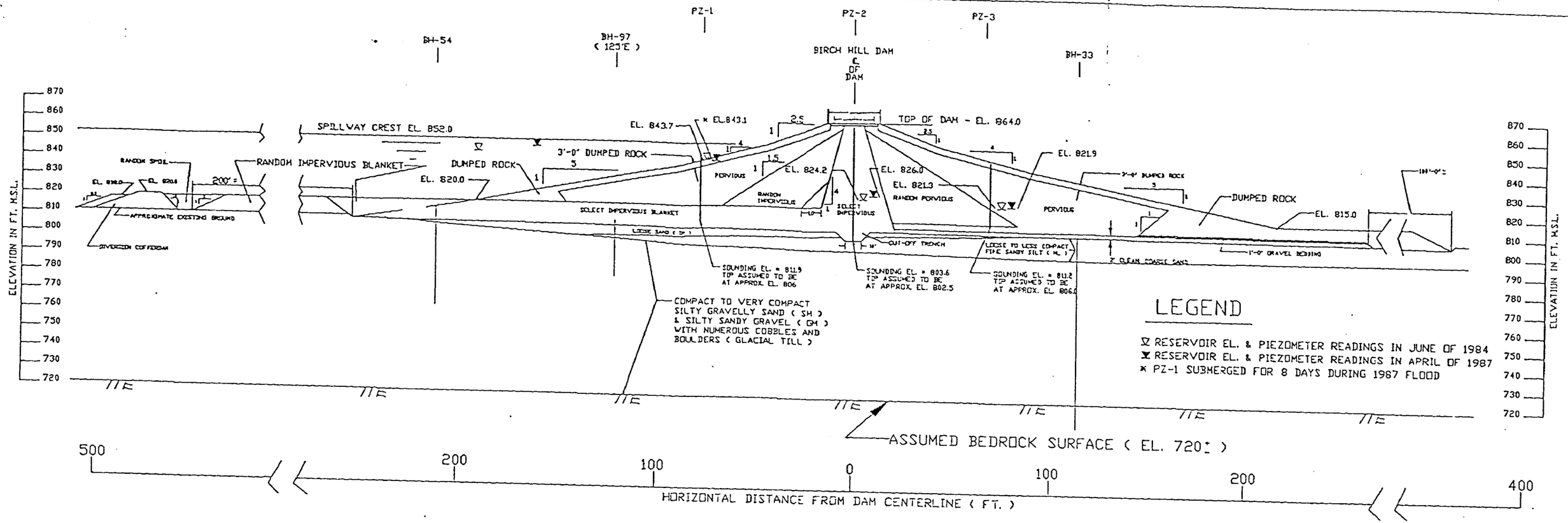
COLD RIVER CHANNEL

820

FD-88-1 (PZ-11)
FD-88-2 (PZ-10)
FD-88-3 (PZ-15)
FD-88-4 (PZ-14)
FD-88-5 (PZ-12)
FD-88-6 (PZ-13)
FD-88-7 (PZ-16)
FD-88-8 (PZ-17)

Piezometer Installation by
Atlantic Testing Laboratories, Ltd
10/18/88 thru 11/21/88

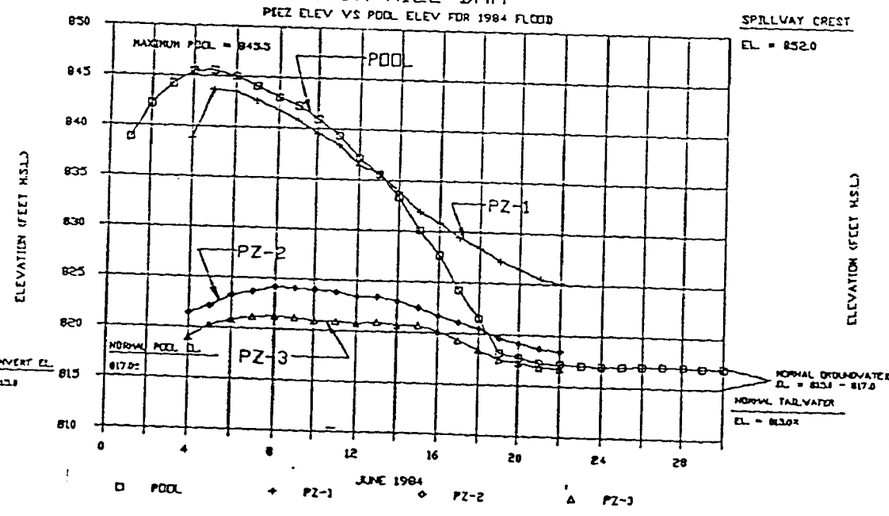
PIEZOMETER LOCATION PLAN

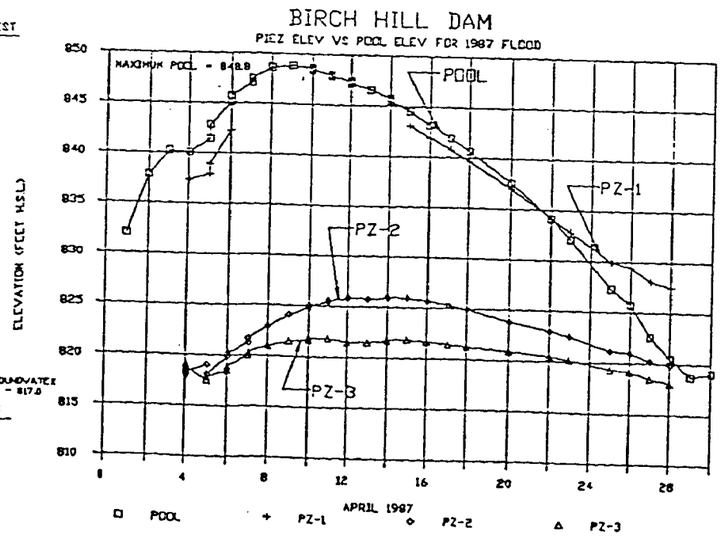


SECTION AT STA. 6+40
SCALE: 1"=50'

PIEZOMETER NUMBER (DATE INS.)	APPROXIMATE LOCATION	EL. OF TOP OF RISER	EL. OF SOUNDING *	ASSUMED ELEV. OF PLATE
1 (1941)	6+40 78'U/S	846.16	811.9	806.0
2 (1941)	6+40 CL	861.71	803.6	802.5
3 (1941)	6+40 69'D/S	844.46	811.2	806.0

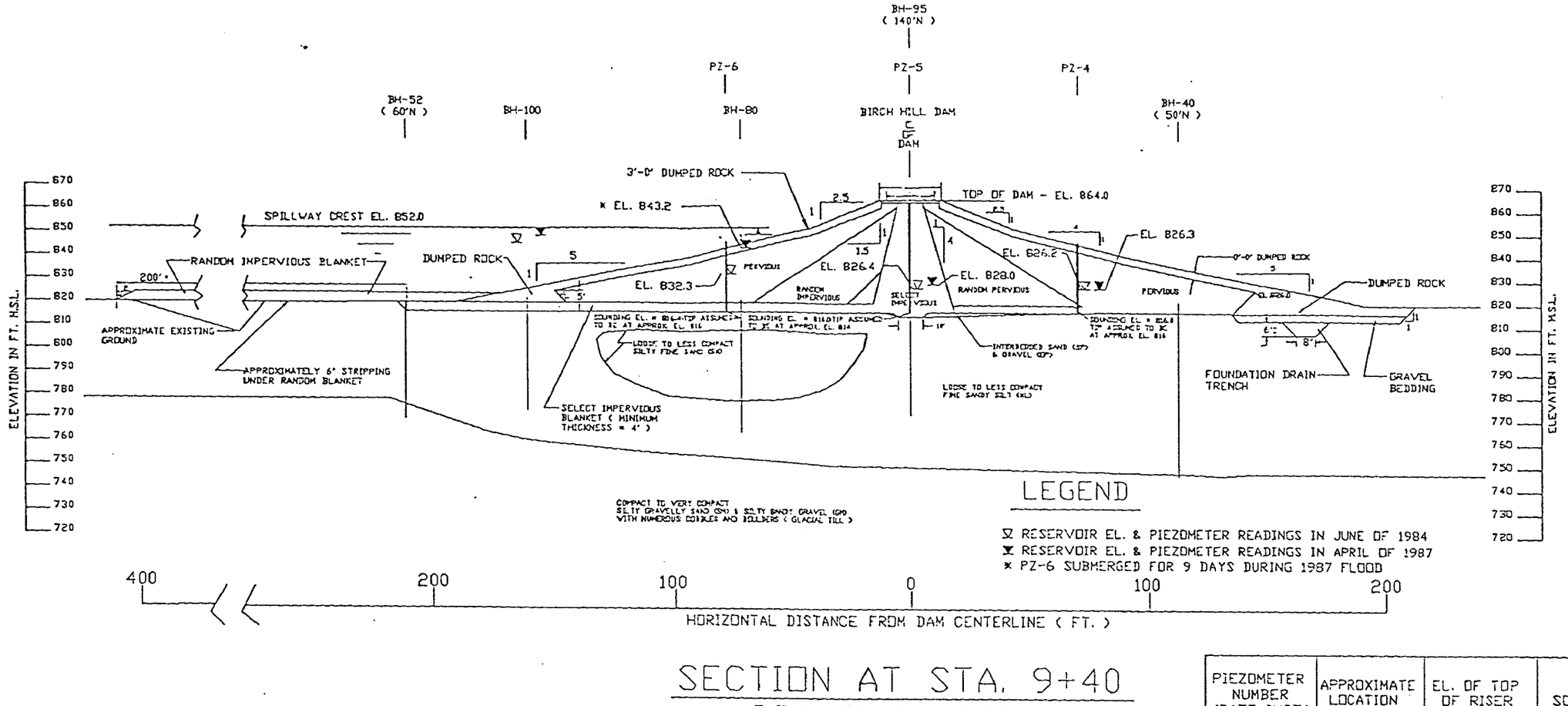
* - FROM SOUNDINGS TAKEN IN 11/86





DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

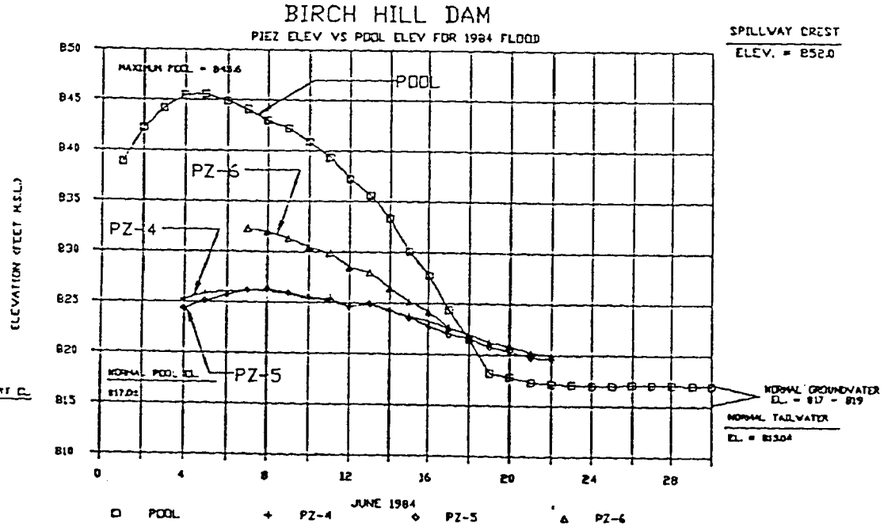
R.C.M./A.J.F. DES. BY	WATER RESOURCES DEVELOPMENT PROJECT CONNECTICUT RIVER BASIN
R.C.M. DR. BY	BIRCH HILL DAM
J.C.H. CK. BY	SECTION - APPROXIMATELY STA. 6+40 POOL LEVEL VS. PIEZOMETER READINGS
GEOTECH. ENG. BR. PLATE NO. 11	SCALE: AS SHOWN DATE: JULY 1988

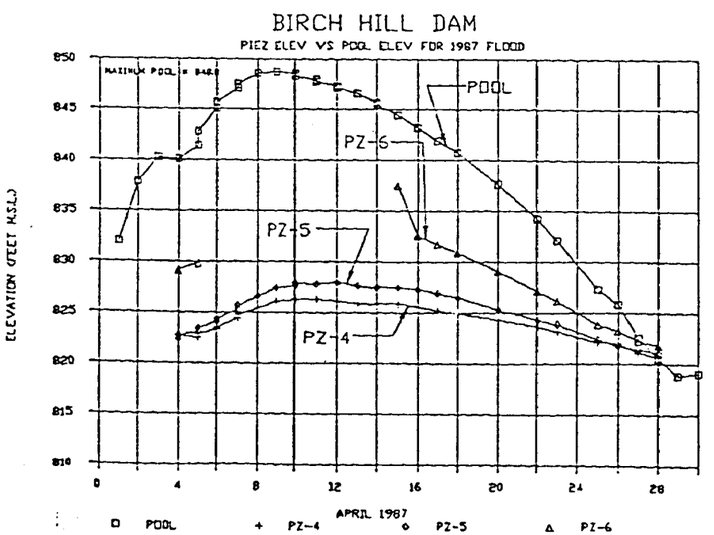


LEGEND

- ▽ RESERVOIR EL. & PIEZOMETER READINGS IN JUNE OF 1984
- ▼ RESERVOIR EL. & PIEZOMETER READINGS IN APRIL OF 1987
- * PZ-6 SUBMERGED FOR 9 DAYS DURING 1987 FLOOD

SECTION AT STA. 9+40
SCALE: 1"=50'





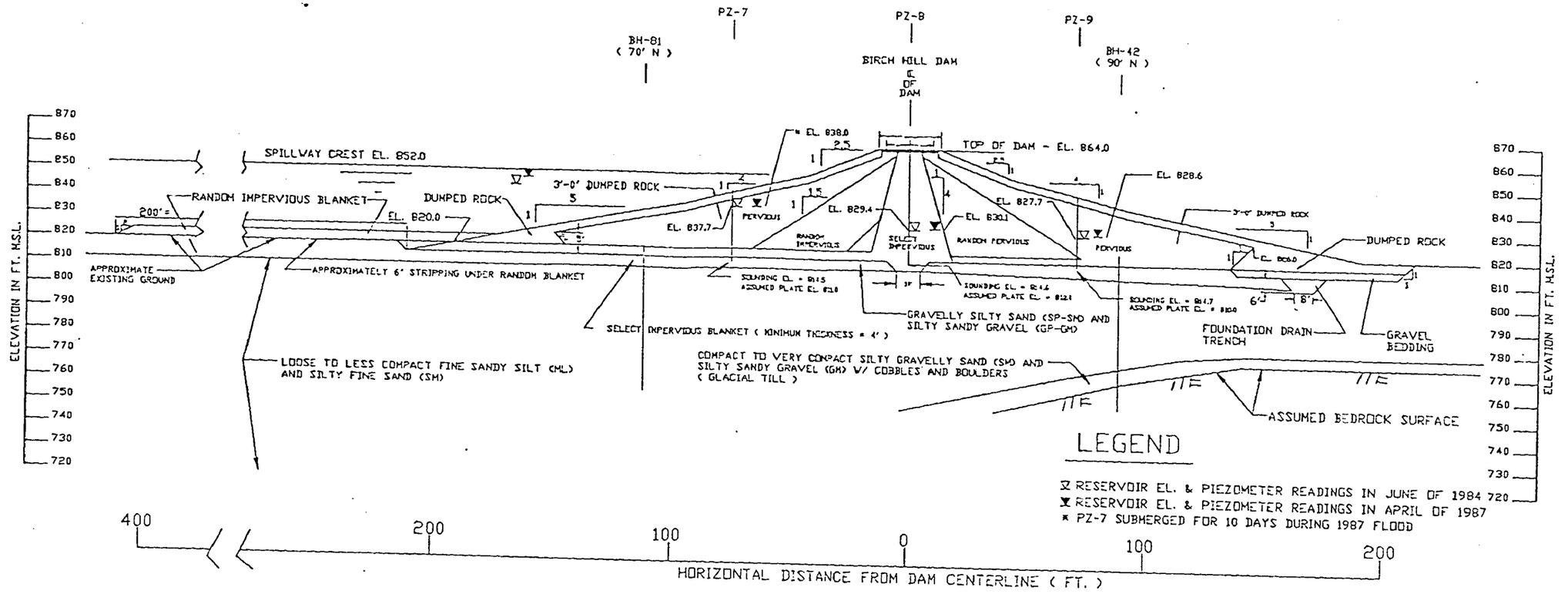
PIEZOMETER NUMBER (DATE INST.)	APPROXIMATE LOCATION	EL. OF TOP OF RISER	EL. OF SOUNDING*	ASSUMED PLATE EL.
4 (1941)	9+40 70'D/S	846.15	816.8	816
5 (1941)	9+40 CL	862.75	816.0	814
6 (1941)	9+40 78'U/S	846.17	816.4	816

* - FROM SOUNDINGS TAKEN IN NOV. 1986

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

R.C.M./A.J.F. DES. BY	WATER RESOURCES DEVELOPMENT PROJECT CONNECTICUT RIVER BASIN
R.C.M. DR. BY	BIRCH HILL DAM
J.C.H. CK. BY	SECTION - APPROXIMATELY STA. 9+40 POOL LEVEL VS. PIEZOMETER READINGS

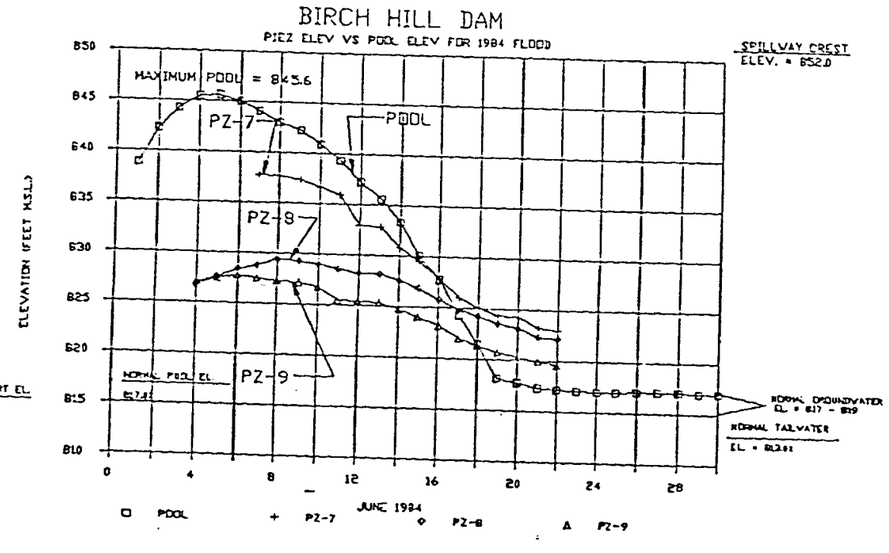
GEOTECH. ENG. BR. SCALE: AS SHOWN
PLATE NO. 12 DATE: JULY 1988

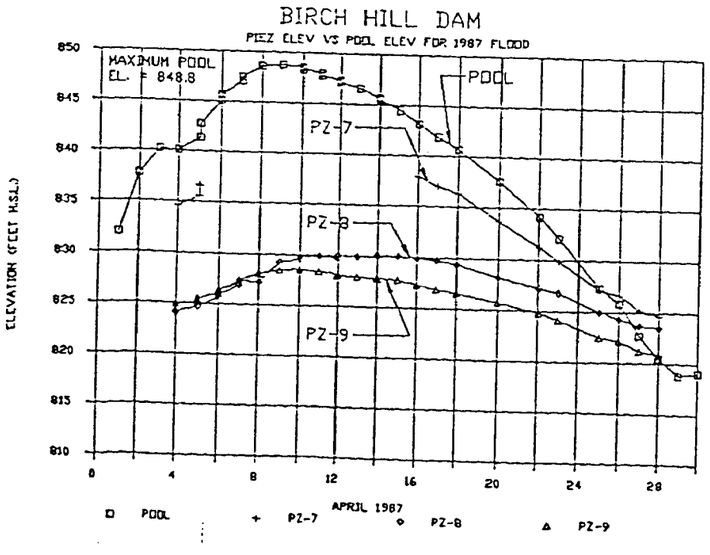


LEGEND

▽ RESERVOIR EL. & PIEZOMETER READINGS IN JUNE OF 1984
▼ RESERVOIR EL. & PIEZOMETER READINGS IN APRIL OF 1987
* PZ-7 SUBMERGED FOR 10 DAYS DURING 1987 FLOOD

SECTION AT STA. 12+43
SCALE: 1" = 50'





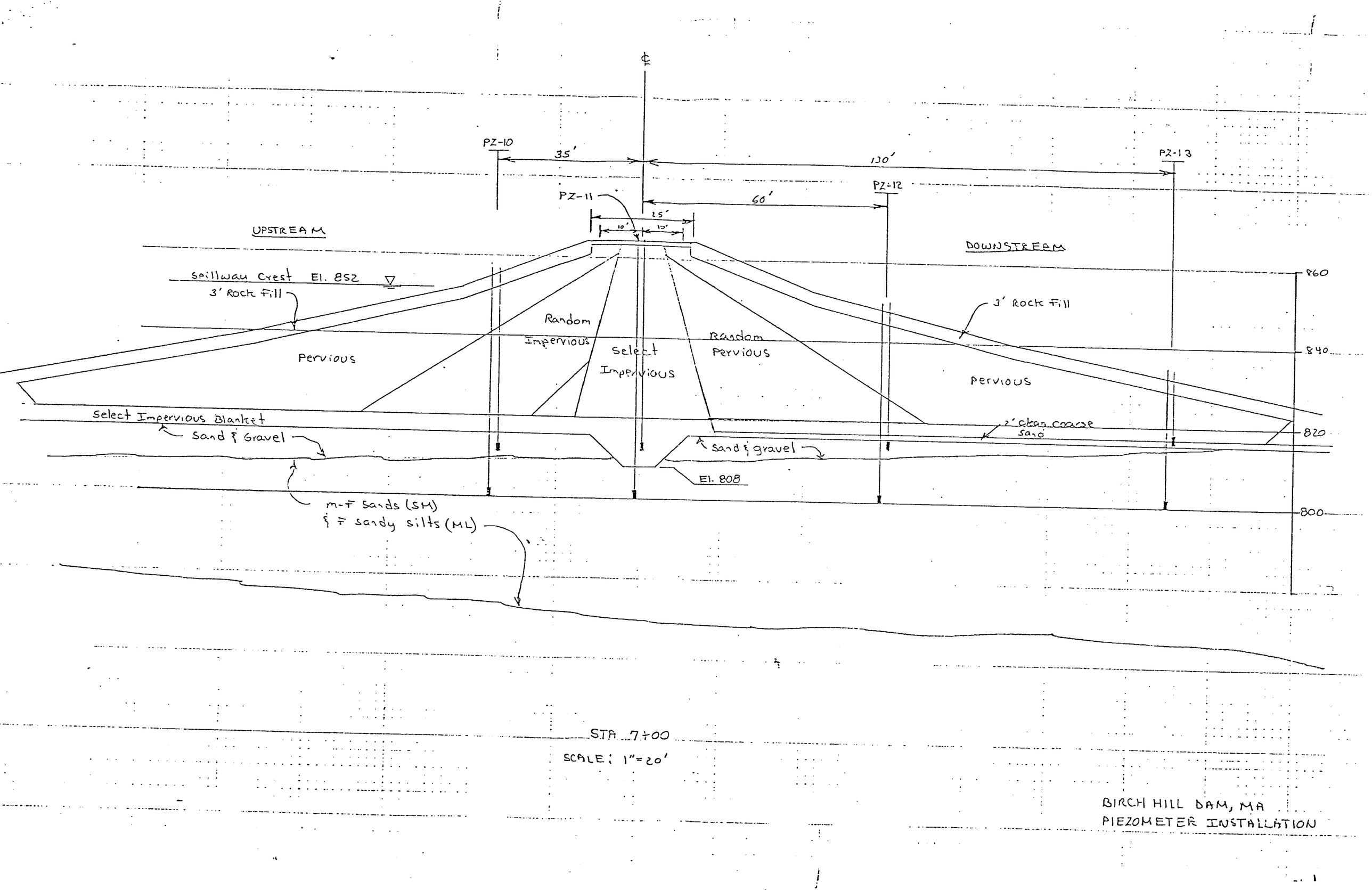
PIEZOMETER NUMBER (DATE INST.)	APPROXIMATE LOCATION	EL. OF TOP OF RISER	EL. OF SOUNDING*	ASSUMED PLATE EL.
7 (1941)	12+43 75'U/S	844.83	814.5	811.0
8 (1941)	12+43 CL	862.36	814.6	812.0
9 (1941)	12+43 70'D/S	845.12	814.7	810.0

* - FROM SOUNDINGS TAKEN IN NOV. 1986

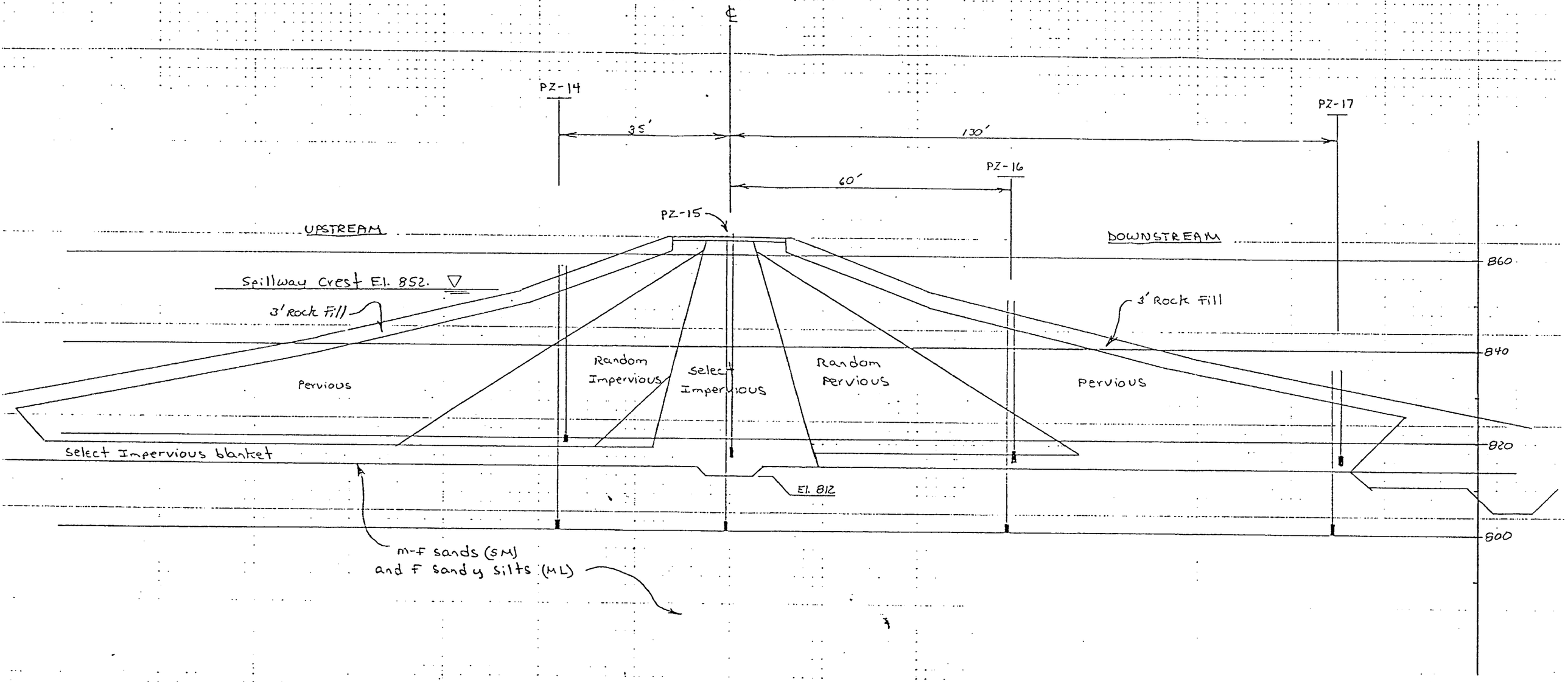
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

R.C.M./A.J.F. DES. BY	WATER RESOURCES DEVELOPMENT PROJECT CONNECTICUT RIVER BASIN
R.C.M. DR. BY	BIRCH HILL DAM
J.C.H. CK. BY	CROSS SECTION - STA. 12+43 POOL LEVEL VS. PIEZOMETER READINGS

GEOTECH. ENG. BR. SCALE: AS SHOWN
PLATE NO. 13 DATE: JULY 1988



BIRCH HILL DAM, MA
PIEZOMETER INSTALLATION



STA 10+50

SCALE: 1"=20'

Birch Hill DAM, MA.

PIEZOMETER INSTALLATION

Plate 11

SECTION 9

OTHER RECORDS TAKEN

a. Survey Notes & Data

Weather: windy.

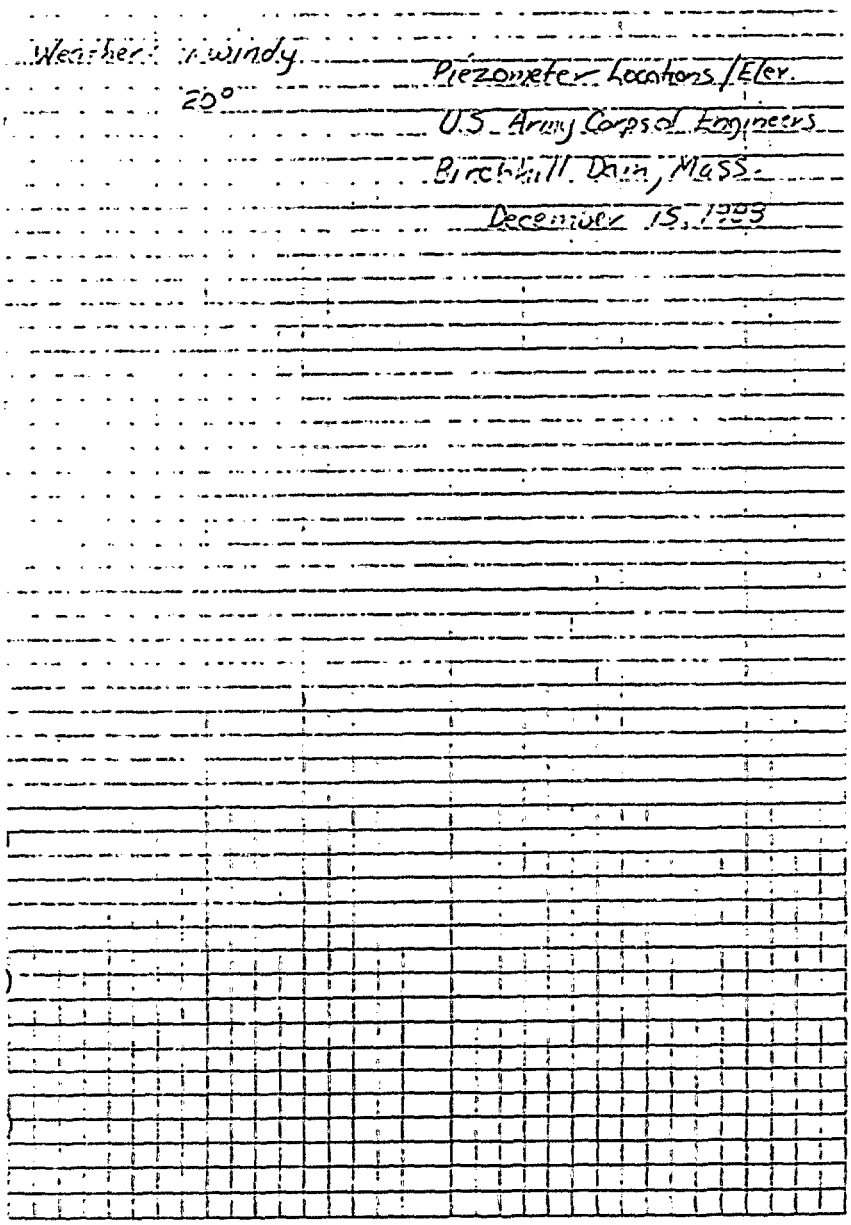
20°

Piezometer Locations / Elev.

U.S. Army Corps of Engineers

Birchhill Dam, Mass.

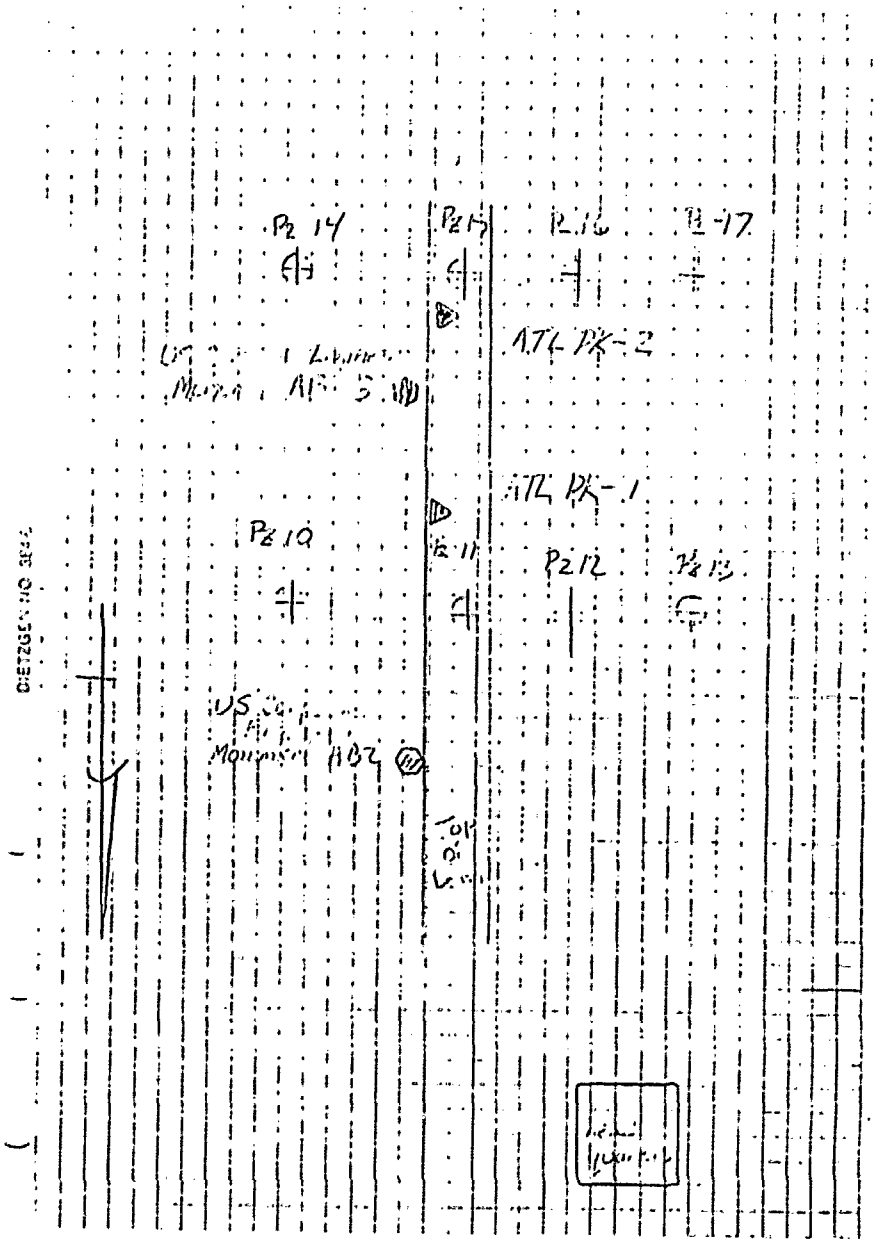
December 15, 1993



Page 1

	Horiz Angle	Horiz Dist	Difference Elevation	Rod H.I.
	Note: Due to excessive instrument vibration from high winds, piezometer locations and elevations were also shot from PK-1 for verification			
P_Z-17	236 00 02	143.15	-34.16	0.0
P_Z-16	211 48 13	86.61	-12.26	5.0
P_Z-15	175 33 17	70.50	0.38	5.0
P_Z-14	144 47 50	83.53	-6.17	5.0
Mon. AB-3	09 25 46	140.56	-0.47	5.0
P_Z-13	336 51 58	304.01	-28.71	5.0
P_Z-12	349 51 10	282.03	-13.55	5.0
PZ-11	00 48 18	278.74	-4.48	0.0
PZ-10	09 06 16	283.32	-10.85	0.0
Mon AB-2	03 40 26	339.47	-0.39	5.0
Sat PK2				
BS PK-1	IH = 4.80	210.50	+0.28	5.0
PK-2	189 44 26	140.54	1.00	5.0
PK-1	342 36 42	75.34	1.10	5.0
Sat AB-3				
BS AB-2	IH = 4.67	200.12	0.48	5.0

Page 1A



Page 3	Northing	Easting	Elevation	Dist. Rod
PZ-13	120 1053	137.74	-34.14	0.0
PZ-12	143 3350	83.54	-19.17	0.0
PZ-11	1830258	68.59	-0.10	5.0
PZ-10	212 5313	32.55	-11.25	0.0
MON AB-3	342 1437	75.42	-0.94	5.0
PZ-14	350 2216	283.07	-6.54	5.0
Mon AB-4	354 5614	272.73	-1.04	5.0
PZ-15	358 5141	291.36	0.12	5.0
PZ-17	22 1525	313.78	-34.67	0.0
PZ-16	09 0955	287.58	-12.69	5.0
Tat PK-1				
BS PK-2	IH = 5.14	210.47	-0.27	5.0

Page 3

Piezometer	Piezometer from Casing	[illegible] From Piezometer	[illegible] in [illegible]'
Pz 14 Orange	-0.40'	37.30'	-3.9
Grey	-0.32	39.45	
Pz15-Orange	-0.15	37.6	-level!
-Grey	0.15	46.4	
Pz 16-Grey	-0.70	32.4	3.2
Orange	-0.79	33.1	
Pz 17-Or.	-0.21	17.0	2.9
Pz 17-Grey	-0.32	17.0	
Pz 10-Oran.	-0.12	40.15	3.2
Pz 10-Grey	-0.04	40.5	
Pz 11-Oran.	-0.30	46.7	level
Pz 11-Grey	-0.25	47.5	-
Pz 12-Oran	-0.31	33.8	3.5
Pz 12-Grey	-0.85	(7.7)	
Pz 13-Oran	-0.59	19.0	2.7
Pz 13-Grey	-0.60	19.1	

SPENCER F. THEW, P.E./L.S.
P.O. BOX 29
CANTON, N.Y.

Date: 01-03-89
Page: 1

Coordinate File: CKCD033.CRD
List of Coordinate Points
* Denotes Contouring Masspoint

Point ID	NORTH	EAST	ELEV	Descriptor
2	594979.8157	432164.0579	863.5650	MON AB-2
3	594780.6854	432144.9587	863.4550	MON AB-3
4	594581.7718	432124.8458	863.3470	MON_AB-4
8	594854.4036	432129.4108	864.2250	PK 1
9	594645.0743	432108.0652	864.1250	PK 2
10	594918.8197	432181.0351	858.1100	PZ 10
11	594922.1730	432139.9891	864.2650	PZ-11
12	594926.2999	432086.8683	850.1950	PZ 12
13	594935.3726	432017.9822	835.2250	PZ 13
14	594571.9581	432148.2029	857.8250	PZ 14
15	594573.9832	432106.4358	664.4850	PZ 15
16	594576.5903	432055.1005	851.6700	PZ 16
17	594577.5567	431981.7164	834.6950	PZ 17
23	594780.6137	432145.0065	863.4250	MON AB 3 CHECK
24	594581.6976	432125.7950	863.3250	MON AB 4 CHECK
102	594979.8923	432164.0723	864.3150	MON AB-2 CHECK
103	594780.6636	432145.0412	863.4550	MON AB-3 CHECK
110	594918.2338	432181.0444	858.0700	PZ 10 CHECK
111	594921.9517	432140.2353	864.4550	PZ 11 CHECK
112	594926.3013	432086.7972	850.3750	PZ 12 CHECK
113	594935.3131	432017.6021	835.2150	PZ 13 CHECK
114	594572.2878	432149.0454	857.7550	PZ 14 CHECK
115	594574.5947	432106.3708	864.3050	PZ 16 CHECK
116	594576.4782	432055.1893	851.6650	PZ 16 CHECK
117	594577.4793	431981.8795	834.7650	PZ 17 CHECK

Coordinates and elevation as recorded were done from PK-1.

Coordinates are determined from [illegible] for check [illegible]. See note on survey notes page 1.

SUMMARY TABLE
PIEZOMETER LOCATIONS AND ELEVATIONS
BIRCH HILL DAM, SOUTH ROYALSTON, MA

Identification				ELEVATIONS			
				Top of Riser		Top of	
FD#	PZ#	Northing	Easting	Lower Piezometer	Upper Piezometer	Protective Pipe	Dam Surface
FD-88-1	PZ-11	594922.17	432139.99	864.01	863.96	864.26	Flush 864.3
FD-88-2	PZ-10	594918.82	432181.04	858.07	857.99	858.11	854.9
FD-88-3	PZ-15	594573.98	432106.44	864.33	864.33	864.48	Flush 864.5
FD-88-4	PZ-14	594571.96	432148.20	857.50	857.42	857.82	854.0
FD-88-5	PZ-12	594926.30	432086.87	849.35	849.89	850.20	846.7
FD-88-6	PZ-13	594935.37	432017.98	834.62	834.64	835.22	832.5
FD-88-7	PZ-16	594576.59	432055.10	850.97	850.88	851.67	848.4
FD-88-8	PZ-17	594577.56	431981.22	834.38	834.49	834.70	831.8